

Urban Songbird Habitat: Landscape Design Guidelines



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Executive Summary

East Fraserlands neighbourhood development (EFL) is focused on the creation of a vibrant and complete community that supports and reinforces the integrity of local ecosystems. A primary element of EFL's sustainability strategy is an initiative to enhance local biodiversity within an urban setting. In addition to extensive environmental rehabilitation on a brownfield site, EFL will be one of the first urban communities to design a landscape around the concept of wildlife habitat, specifically for songbirds.

The Urban Songbird Landscape Guidelines are intended to provide general design directions for maximizing the diversity of bird species using the East Fraserlands neighbourhood site for nesting and foraging. The Guidelines are a response to decreased bird populations in urban environments throughout Canada. Through this initiative, East Fraserlands is leading the way in finding solutions to urban songbird habitat loss.

This document provides guidelines intended to support and encourage songbird habitat landscape design throughout the East Fraserlands community. The guidelines will serve as a reference and design tool for EFL's planners and landscape designers. The design strategies within this document are based on the study of songbird foraging guilds and the components of associated habitat types. Necessary elements of a vigorous habitat are explored through design principles and specific guidelines for a range of urban landscapes within EFL are provided.

1.0 Introduction

1.1 The Purpose of the Guidelines

The Urban Songbird Habitat Landscape Design Guidelines are a resource for re-establishing songbird habitat within the community of East Fraserlands, a high density urban environment located on a former brownfield site on the Fraser River. The guidelines are part of an overarching sustainable development strategy, reflecting ParkLane Homes' commitment to create a community that is in harmony with the natural environment, offers livable and socially vibrant neighbourhoods, and contributes to a robust economic setting for new development.

The Urban Songbird Landscape Design Guidelines have been prepared to ensure that the East Fraserlands neighbourhood will be designed, developed, and maintained to maximize the diversity of bird species using the site for foraging. This will be achieved by enticing birds to the new community by establishing a range of preferred habitats for as many bird foraging guilds as possible in public areas such as parks, streets, greenways, and new wetland habitats. This work is even more important to new urban developments in the Lower Mainland with its location in one of the most biodiverse parts of the province and as part of the Pacific Flyway of migratory birds.

1.2 The East Fraserlands Community

East Fraserlands will be an East Vancouver neighbourhood development for approximately 13,000 people located on a brownfield site on the Fraser River south of Everett Crowley Park. The site will be developed as a progressive sustainable community by ParkLane Homes. For most of the 20th century, the EFL site was home to a number of sawmill operations. ParkLane purchased the site in December 2003 and shortly thereafter began soils remediation of the site that had been previously contaminated by industrial operations. The 130 acre brownfield site will be 100% remediated for the project.

1.3 ParkLane Homes Ltd.

ParkLane Homes is one of the most established and respected residential developers in western Canada. ParkLane has been recognized for building excellence with over 200 awards including the Best Builder in BC and Canada awards. The company is well-known for the development of master-planned communities that provide neighbourhoods with access to a variety of amenities. ParkLane displays an exceptional level of environmental responsibility for a development company. They are focused upon ensuring that their residential developments contribute to a healthy environment through initiatives such as an extensive waste management program and the integration of sustainability principles into community design.

1.4 Urban Design and the Natural Environment

During the past few decades, there has been a realization that urban environments often have a negative impact on ecological systems, at both local and global scales. These impacts have been widespread, affecting several functions within the atmosphere, hydrosphere, and lithosphere. Many environmental issues have been traced back to the configuration of human settlements - modern transportation systems have degraded air quality, industrial systems have contaminated water bodies, and neighbourhoods have displaced wildlife habitat. Wildlife has been hard hit by human activity. For songbirds, habitat loss is the primary reason for decline.

Initially, modern methods of urban development were slow to change, largely carrying on without significant modification to reduce ecological impacts. However, the movement to create 'sustainable' or socially, environmentally, and economically responsible communities is now growing rapidly with companies such as ParkLane leading the way.

1.5 Contents of the Document

This document reviews the importance of songbird habitat in Greater Vancouver, as well as songbird foraging guilds and their preferred habitat types. The physical configurations and functions of both urban and ecological landscapes are evaluated, isolating the factors that may contribute to the reconstruction of songbird habitat. A set of design principles as well as the identification of specific landscape design opportunities for the East Fraserlands site are provided to guide the landscape design process.

2.0 General Discussion of Songbirds

Worldwide, songbirds face a sobering fact: Over one fifth of the world's bird population is facing extinction over the next century (BirdLife International).

There are numerous reasons why the decline of songbirds is of serious concern. In addition to being part of our biological heritage, songbirds provide essential ecosystem services for the natural environment. Songbirds are closely tied to ecological function, engaging in actions such as controlling insect populations and assisting in seed dispersal and germination. The decline of songbirds is an indication that ecosystems are imbalanced. Songbird behaviour has drawn the attention of the scientific community in a diversity of ways. In 2004, biologists noticed similarities between how songbirds learn to sing and how humans learn to speak. It is anticipated that these parallels will help researchers study the basis of human language. Indeed, it was in the disappearance of songbirds that the famous book, *Silent Spring*, landed the modern environmental movement.

The psychological benefits of songbirds are extensive. From the outline of a bird shadow sweeping under our feet on the pavement, to the sight of a child feeding birds in the park, songbirds are rooted in human consciousness. Birds have found their way through our imagination and histories into religion and culture. For example, the American poet, Wallace Stevens writes, "But when the birds are gone, and their warm fields return no more, where, then, is paradise?"

The largest threat to songbirds is habitat loss. In Canada, often areas with the greatest biodiversity are also the areas of heaviest human use. The Lower Fraser Valley is a prime example of the overlap between ecosystem diversity and intensity of human impact.

BC is the most biologically diverse province in Canada and the Georgia Basin region supports the highest diversity of birds within the province. The significance of the Lower Mainland on the health of songbird habitat has been recognized by local, national, and international organizations. The GVRD is working to protect habitat with the development of the Regional Biodiversity Conservation Strategy, the first regional strategy of its kind in Canada. International conservation initiatives such as the Important Bird Areas of Canada Program and local conservation initiatives such as the Delta Farmland and Wildlife Trust are working to ensure that the considerable bird habitat of the Fraser River Delta is preserved. The Fraser River Delta is a primary stop on the Pacific Flyway, a major North-South route for millions of migratory birds. Degradation of habitat on flyway stops can lead to more birds dying on route or a reduction in reproduction success upon arrival at breeding grounds. The delta also provides year round habitat for many resident species.

Despite conservation efforts, the human population of Greater Vancouver continues to exert pressure on songbird habitat. In addition to conservation efforts, urban communities must find ways to mitigate habitat destruction in order to preserve a high level of species health and diversity in our region. The Lower Fraser Valley is an ideal location for the exploration of innovative habitat protection and design for songbirds.

3.0 Foraging Guilds

It is useful to group songbirds into foraging guilds rather than attempt to provide specific habitat features for numerous individual bird species. A foraging guild is a category of birds grouped primarily according to their food finding behaviour. However, nesting and mating behaviours may also relate to these groupings. This allows the categorization of groups of birds that prefer the qualities of particular habitat types. Therefore, management and design recommendations can be made that benefit several species simultaneously.

3.1 The 12 Foraging Guilds of the Lower Mainland

Guild	Habitat Use
• Guild A (Insect Gleaners)	Deciduous Forest, Mixed Forest
• Guild B (Hawkers)	Deciduous Forest, Mixed Forest, Salt Water
• Guild C (Probing)	Freshwater, Shorezone, Old Field, Meadow
• Guild D (Chiseling)	Mixed Forest
• Guild E (Leaf Tossers)	Deciduous Forest, Old Field
• Guild F (Diving)	Shorezone
• Guild G (Swooping)	Deciduous Forest, Shorezone
• Guild H (Dabbling)	Shorezone, Salt Water
• Guild I (Wading)	Shorezone, Old Field
• Guild J (Scavenging)	Park, Shorezone, Deciduous Shrub
• Guild K (Frugivorous)	Deciduous Forest, Park, Meadow
• Guild L (Granivores)	Deciduous Forest, Old Field

3.2 Birds of Concern in the Fraser River Delta

The following bird populations have all suffered some degree of decline over the past century. Habitat protection and restoration in an important bird habitat region such as the Fraser River Delta increases the ability of these species to re-establish stable population sizes.

Purple Martin *Progne subis* Guild B (Hawking)

Purple Martins are colony nesters that prefer to nest in snags situated within fresh or salt water riparian areas. This species declined in 1949 due to the lost of historic nest sites in the lower Fraser Valley and competition with the introduced species, European Starlings and House Sparrows . A successful artificial nest program has allowed the Purple Martin population to expand, but the population remains



small. The February 2006, the Purple Martin was shifted from a Red Listed species (Extirpated, Endangered, or Threatened) to a Blue Listed species (Sensitive). Image www.home.earthlink.net

Vesper Sparrow *Pooecetes gramineus*
Guild A (Gleaning)

Vesper Sparrows nest in grasslands, clearings and old fields. The Vesper Sparrow affinis subspecies is categorized as Endangered by The Committee on the Status of Endangered Wildlife in Canada and is on the BC Red List (Extirpated, Endangered, or Threatened). The decline of this species is attributed to habitat loss due to agriculture and urban development and predation by Brown-headed Cowbirds. Image www.home.earthlink.net



Wilson's Warblers *Wilsonia pusilla*
Guild A (Gleaning)

Wilson's Warblers tend to nest in wet, shrubby areas such as stream corridors and along wetland edges. Loss of riparian habitat contributes to the decline of this songbird. The 2006 BC List Changes note that Wilson's Warblers are showing, "significant long- and short-term declines." Image www.fs.fed.us



4.0 Regional Habitat Types

A habitat type is an area of the natural or anthropogenic environment that has specific attributes or conditions. The features of a habitat type include site hydrology, soil type, site geography, microclimate, and the composition, diversity, and type of vegetation. Habitat types can be identified as areas with various features that are favorable to a particular species or group of species. Most bird guilds do not use a single habitat, but rather a range of habitats. Certain habitats can be more valuable than others in that they support more guilds.

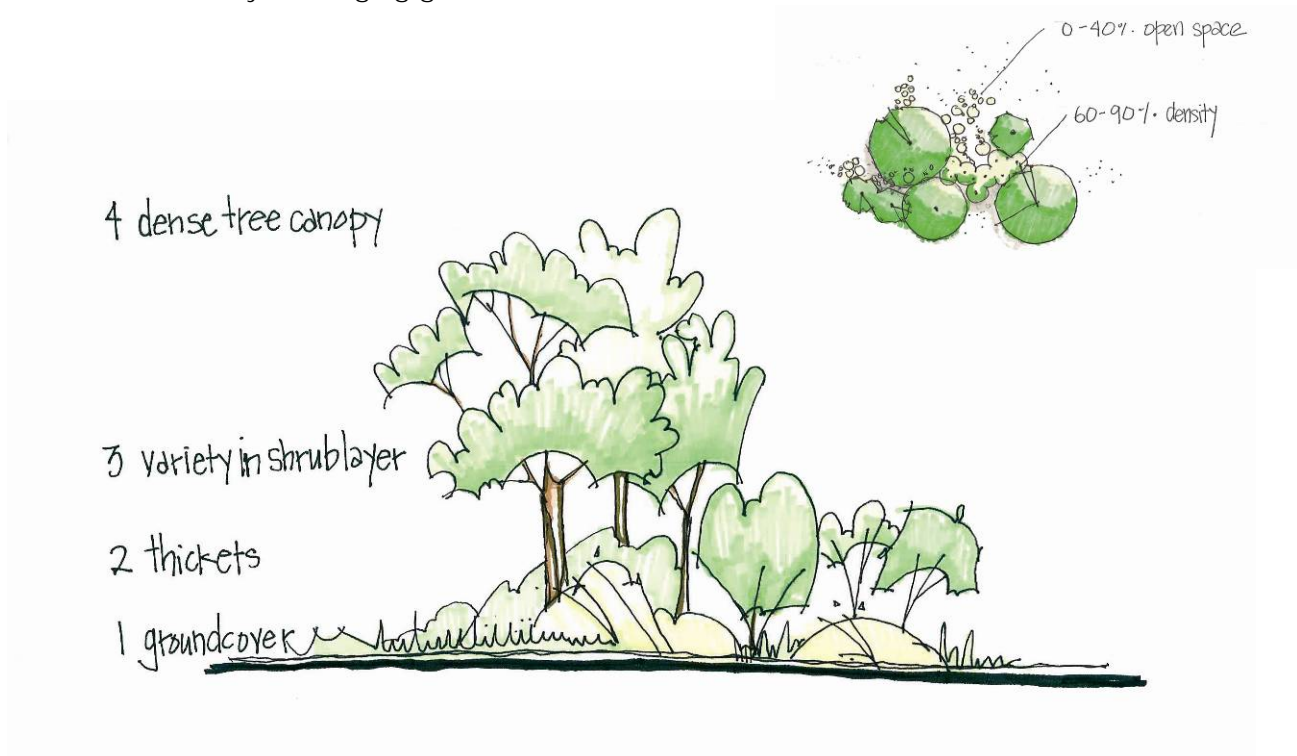
For any particular habitat type there are certain attributes that improve the quality of the habitat i.e. make it more productive. One variable that researchers have found repeatedly is foliage height diversity. In any wooded area e.g. forest, hedgerow, wetland margin or even an old field, having as many as six distinct foliage heights or layers enhances the number of species and individuals using the site. This ensures a maximum number of niches for nesting, foraging, or cover for a maximum number of species. Thus a good quality forest habitat would have an herbaceous ground layer, a shrub layer, an understory tree layer and a canopy tree layer. In forested areas the diversity of trees within the canopy also increases species richness and numbers of individuals. Because many birds accept a variable diet, food requirements are considered to be plastic and therefore not a determining factor with respect to habitat selection during the breeding season. The exception to this would be plants that have persistent fruits or seeds that overwinter on the plant. These do provide much needed food in winter or in the early spring when migratory birds return.

Thus, existing or proposed habitats can be enhanced through the addition of tree canopy species, the number of persistent food plants or increased foliage height diversity. The following descriptions outline the important features of 8 key habitat types that are valuable to incorporate into the EFL songbird habitat landscape design.

4.1 Deciduous Forest

Description

A deciduous forest is a vegetated area with a dense tree canopy and richness of plant species. Deciduous forests often have many vertical layers of stratification including large deciduous trees, small trees and saplings, shrubs, herbs, and groundcovers. This diversity is, in part, what makes it one of the most valuable habitat types for songbirds, used by a wide variety of foraging guilds.



Features

- Tree Canopy Richness
- Range of food types
- Young 2nd growth forest
- High level of vertical stratification is very important.
- High plant species richness creates a higher level of productivity.
- Canopy diversity is important – how the trees are arranged in the area designated deciduous forest habitat.
 - A diversity of canopy densities is ideal. Generally a deciduous forest habitat area should have 60-90% canopy cover; however, some birds like to move between more and less dense canopy. It is beneficial to leave some of the area with lower canopy cover, approximately 0-40%.

Examples of Bird Species - Deciduous Forest Habitat

Bewick's Wren
(*Guild A - Gleaning*)
Image: wdfw.wa.gov



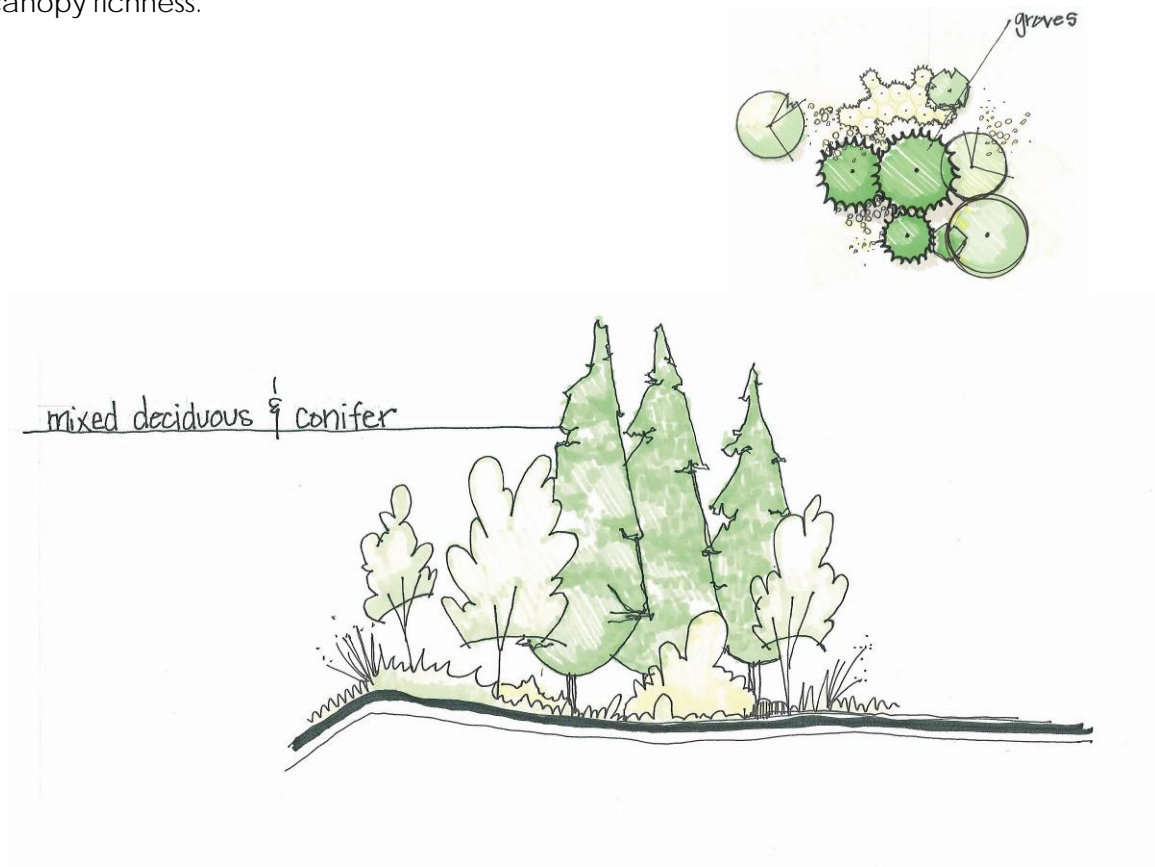
Black-capped Chickadee
(*Guild A - Gleaning*)
Image: Kristi Dubois www.fwp.mt.gov



4.2 Mixed Forest

Description

A mixed forest is a vegetated area of coniferous and deciduous trees having a dense tree canopy and richness of plant species. Mixed forests share many of the characteristics of deciduous forests e.g. several vertical layers of stratification and tree canopy richness.



Features

- High level of vertical stratification
- Tree Canopy Richness
- Range of food types
- 30-50% conifer is optimal – birds leave when the percentage is higher or lower.
- Certain birds are only found in mixed forests.
- Mixed forest is a more advanced seral stage than deciduous forest.
- Groves of conifers within the forest are more beneficial than equal distribution throughout.
- Red cedar, *Thuja plicata* provides the ideal winter thicket cover for birds like owls.

Examples of Bird Species - Mixed Forest Habitat

Willow Flycatcher
(Guild B – Hawking)



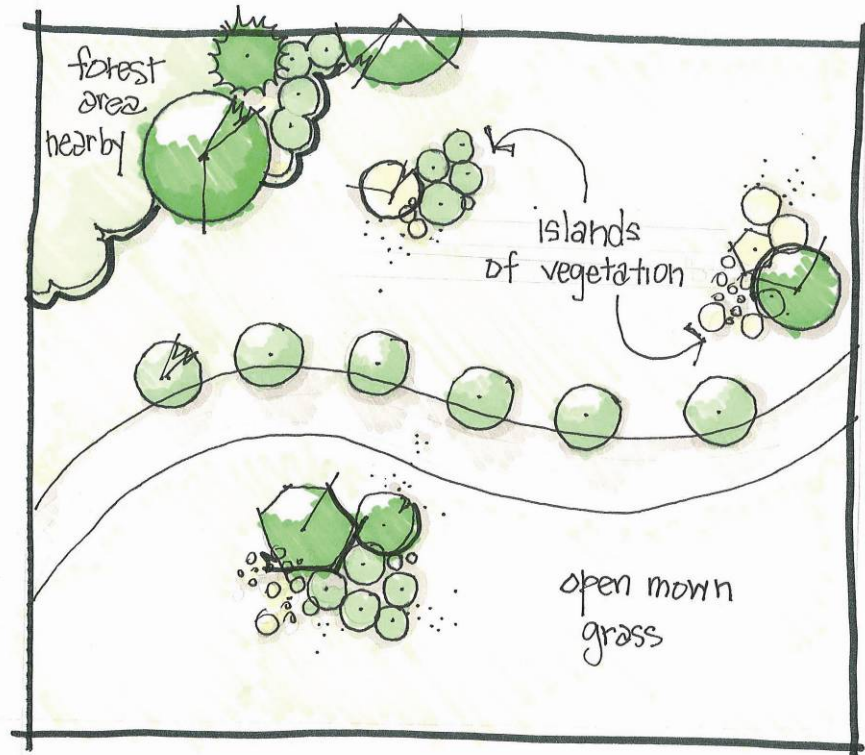
Chestnut-backed Chickadee
(Guild A – Gleaning)



4.3 Park

Description

The park habitat type is an area of open mown grass with islands of native trees and shrubs. Islands of trees and shrubs are essential for increasing a park's habitat value. Islands of vegetation may consist of deciduous or mixed species and are beneficial even when covering a small area.



Features

- Open mown grass with islands of native trees and shrubs
- Surrounded by other key habitat types, especially Forest
- The islands of trees and shrubs are important. A patch of forest as small as 200 sq may provide increased habitat value.
- Islands are mixed or deciduous.
- Islands can be as small as 10 x 10 ft.
- Vertical stratification is important.
- Horizontal patchiness increases habitat value.
- A feathered vegetative edge increases habitat value.

Examples of Bird Species - Park Habitat

Black-throated Grey Warbler
(Guild A - Gleaning)
Image: www.fireflyforest.net



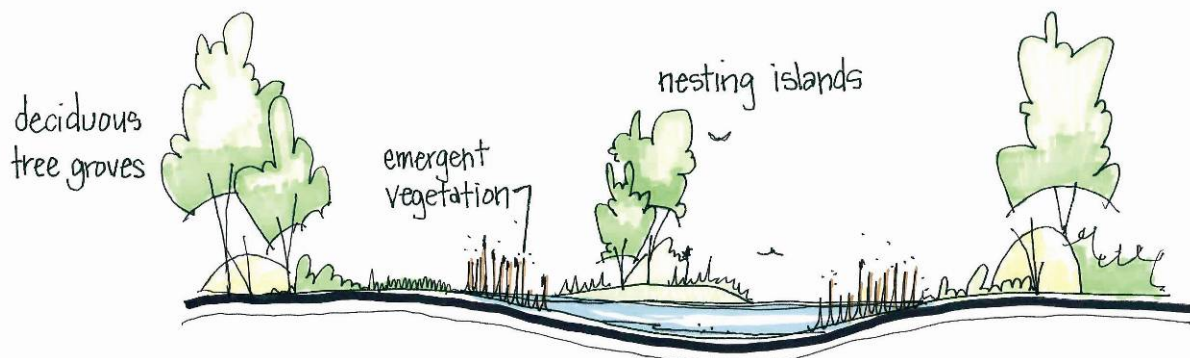
Steller's Jay
(Guild K - Frugivorous)
Image: www.wdfw.wa.gov



4.4 Wetland

Description

Wetland is a habitat type blending an aquatic and terrestrial environment. Formed by a site's hydrology, wetlands have areas of areas of high soil water saturation and plant species that are adapted to low levels of soil oxygen. Wetlands are usually naturally occurring, but are rapidly disappearing due to urban development. Wetlands can also be artificially constructed and serve as a discharge for stormwater runoff or sewage treatment.



Features

- Surrounded with emergent vegetation e.g. Cattails (*Typha* spp.), Bulrushes (*Scirpus validus* or *Scirpus acutus*), Sedges (*Cyperaceae*).
- Surrounded by Old Field and/or Deciduous Forest.
- Containing small nesting islands with low- slope, grassy banks on at least one end.
- The rest of the island is covered with shrubby vegetation and few trees.
- Island and marsh edges should show vertical stratification.
- Ideally wetlands draw down in late summer.
- Grade the pond bottom to avoid colonization by emergent vegetation and maintain a 1:1 rate of open water to emergent vegetation.
- Slope - no steeper than 1:6.
- Cattails should be placed in shallow area of wetland adjacent to shoreline.
- Bulrushes need to have their roots in water, even in late summer - start bulrush planting at .6m deep, further away from the shore.
- Swath of emergent vegetation can be as narrow as 2.5m.

Examples of Bird Species – Wetland Habitat

Barn Swallow
(Guild B – Hawking)

Image: www.geocities.com



Yellow Warbler
(Guild B – Hawking)

Image: www.chandra_as_utexas.edu



4.5 Old Field

Description

Old Field is a predominately grassy area with islands of woody shrubs and tree vegetation, providing thicket cover for songbirds. Old Field vegetation has a high level of vertical stratification. Plant species within Old Field primarily consist of full sun pioneering species with persistent fruits.



Features

- Old Field is a predominately grassy area with islands of woody shrubs and tree vegetation.
- Vertical Stratification of edges and islands.
- Old Field habitat provides thicket cover for bird species.
- This habitat offers a range of food types. This is the ideal location for plants with persistent fruits, as well as insect attracting plants like willows and alders. These plants are a very important feature of the Old Field habitat.
- Horizontal Patchiness: patches of woody vegetation in an Old Field are small (should be no more than 5 m wide and 10-12 m long with most patches being only 2-3 m wide).
- Taken as a whole the woody patches should amount to about 30-40% of the total area.
- Patches of woody vegetation should be at least 2-3 m apart and generally much more.
- There should be a major tree grove near the centre of the Old Field and this should have a solid shrub layer.
- Ideally, the Old Field habitat is surrounded with deciduous forest and wetland.
- Plant species are primarily full sun pioneering species.

Examples of Bird Species – Old Field Habitat

White-crowned Sparrow
(Guild E – Leaf-Tossing)

Image: www.mywebpages.comcast.net



American Goldfinch
(Guild L – Granivores)

Image: Kyle Carlsen www.birdwatchersdigest.com



4.6 Meadow

Description

A meadow is an open, un-mown area made up of long grass, herbaceous plants, and little or no woody vegetation. Many songbirds that nest in the forest forage in the meadow. Meadows provide habitat for raptors and ground nesting birds. Meadows are rare in urban areas where most land is designated for a specific use.



Features

- Meadows should be open i.e. they should have little or no woody vegetation in the matrix.
- Meadows provide habitat for raptors and ground nesting birds.
- Uncut: they should be uncut for period of 3-5 years to enhance prey populations. They should not be cut between March 1 and August 31 to preserve ground nesting birds.
- Well-drained: They should be well-drained so that they will support Townsend's Vole (*Microtus townsendi*).
- They should be about 1-2 acres in size.
- Meadow should be surrounded on at least one side by "perch" trees. These are tall (cottonwood or conifer) trees where raptors perch before swooping on their prey.
- Mow 33% of the grass every year.

Examples of Bird Species – Meadow Habitat

Savannah Sparrow
(*Guild L – Granivores*)

Image: Len Nelson www.petalumawetlandspark.org



White-crowned Sparrow
(*Guild E – Leaf-Tossing*)

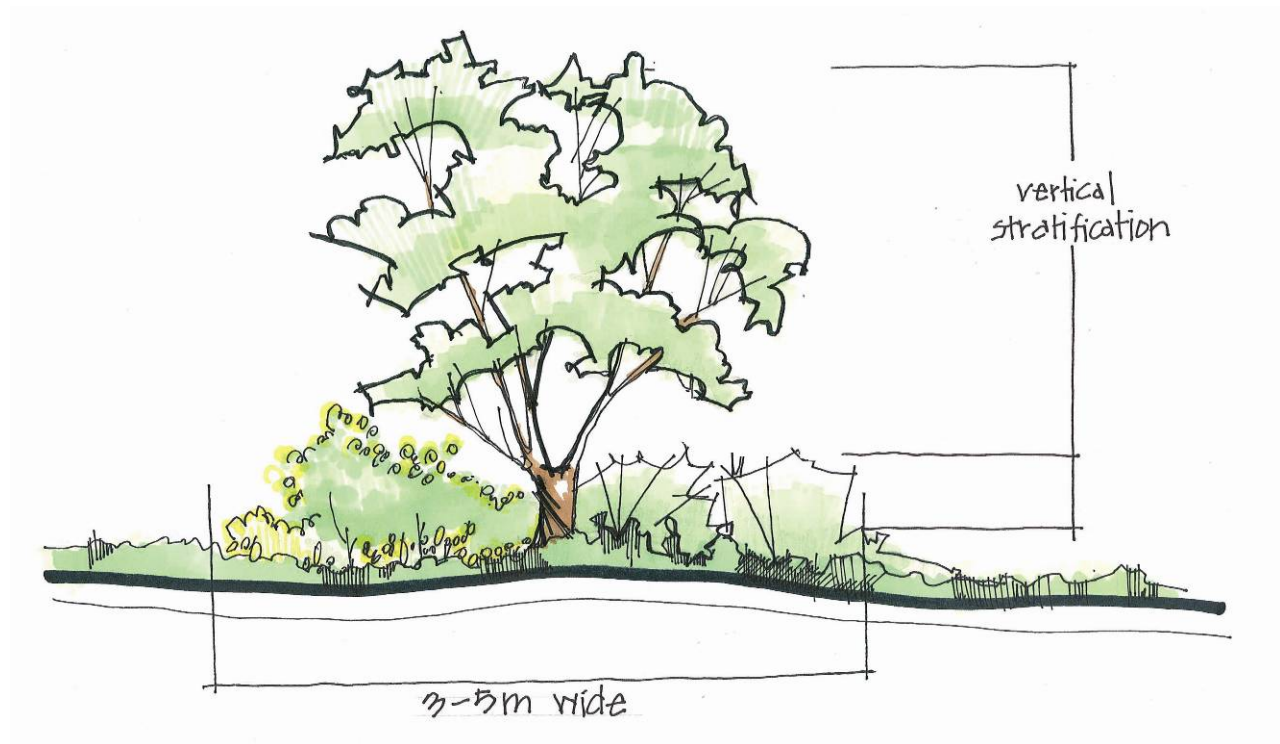
Image: www.mywebpages.comcast.net



4.7 Hedgerow

Description

A hedgerow is a linear planting of trees and shrubs. Hedgerows are often used as an alternative to or in conjunction with a fence. They are characterized by a dense thicket of vegetation, especially understory layers of groundcovers and shrubs.



Features

- Vertical stratification is important – 3-5 layers should provide thicket cover.
- Ideally 3-5 m wide
- Range of species: variety of food sources and plant types
- Good edge i.e. feathered or filtered, not abrupt

Examples of Bird Species – Hedgerow Habitat

Cedar Waxwing
(Guild K – Frugivorous)

Image: www.cedarwaxwing.wdfw.wa.gov



Spotted Towhee
(Guild A – Gleaning)

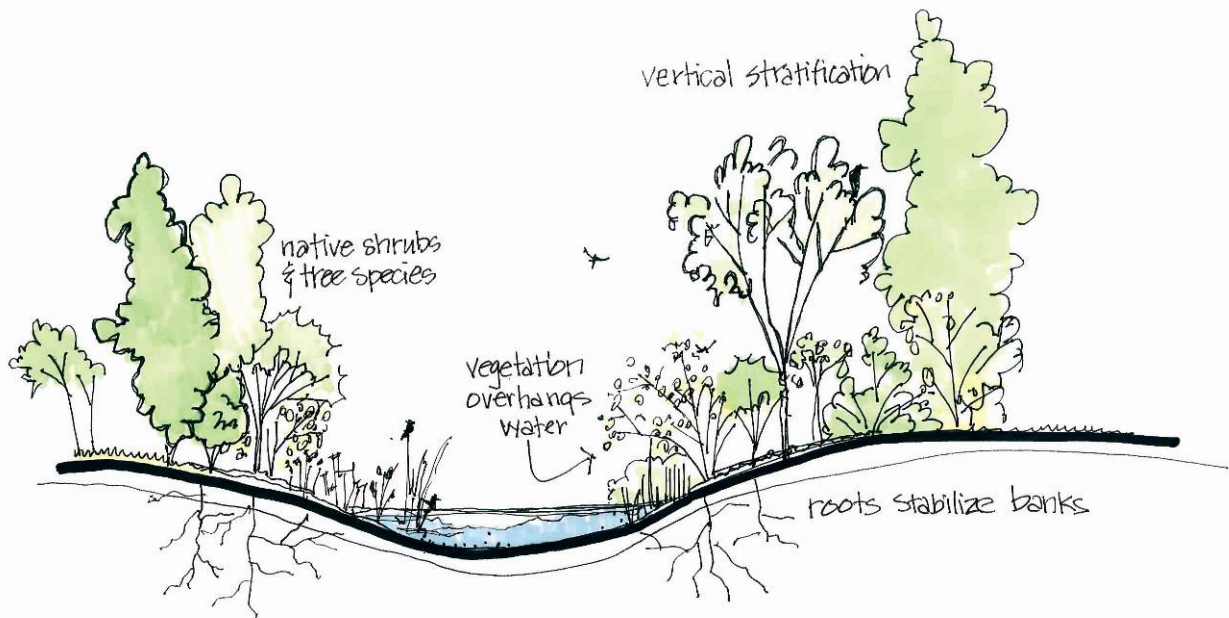
Image: Derrick Ditchburn www.dereila.ca



4.8 Riparian

Description

A Riparian habitat is a transitional area between water and land. The ecological diversity of Riparian habitats creates a high number of niches. It is an important habitat type for a wide range of wildlife; 80% of bird species utilize this habitat type.



Features

- Highly important habitat type
- 80% of bird species use this type.
- 75% of all species use this type.
- This habitat type is ecologically diverse so it provides a maximum number of niches.
- Riparian bug life is a food source for songbirds.
- Riparian is important not only to birds, but also to fish and amphibians.
- Vegetated with woody and herbaceous plants
- Vegetation is vertically stratified or has a number of distinct layers.
- There is a diversity of both native shrubs and of tree species in the canopy.
- Riparian vegetation is wide, at least 15 metres if possible.
- The ground is covered with native groundcovers and leaf litter.
- The vegetation overhangs the water body. The bank is medium to low in slope.
- Vegetation contains tree species such as Red Alder, Black Cottonwood or Red Cedar with root systems to hold the banks.
- Mixture of seral stages.

Examples of Bird Species – Riparian Habitat

European Starling
(Guild E – Leaf-Tossing)
Image: www.birdguide.com



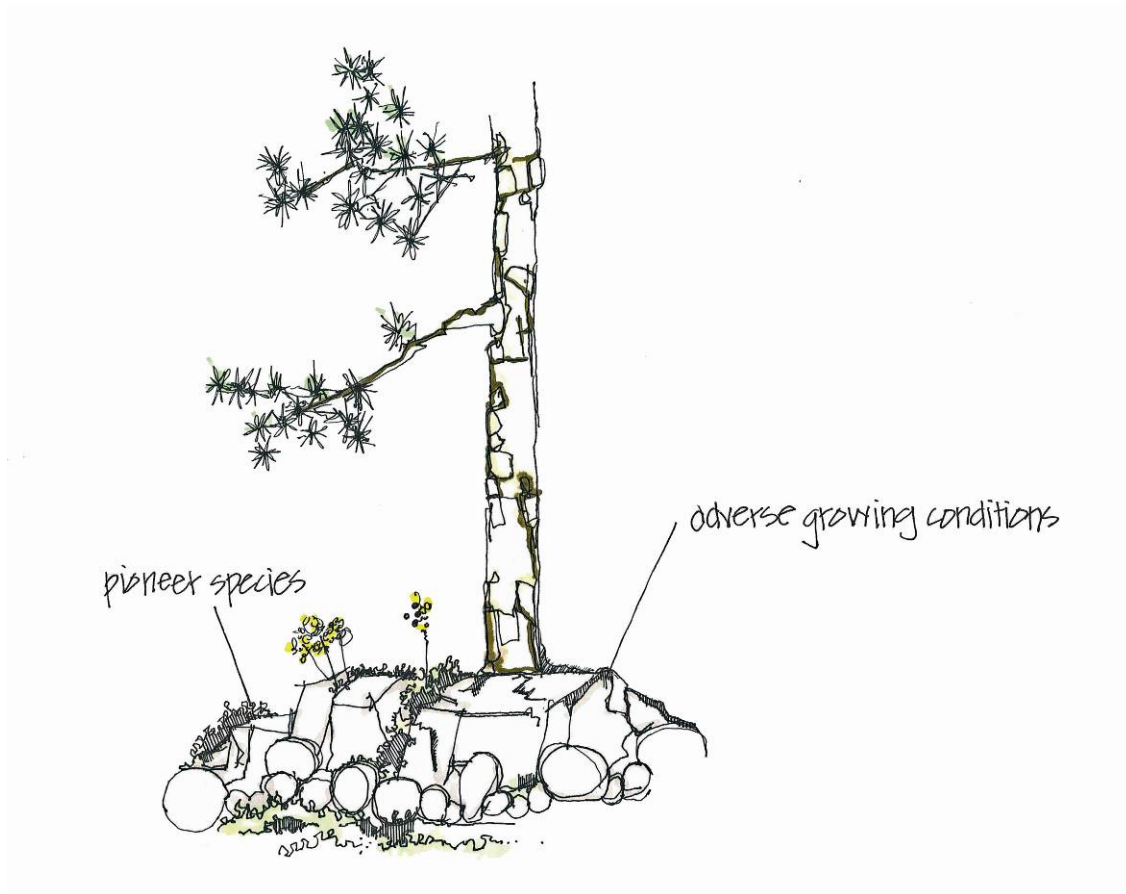
Violet Green Swallow
(Guild B – Hawking)
Image: www.vancouverislandbirds.com



4.9 Interstitial

Description

Interstitial habitat is the term to describe a landscape whose basic nature falls in between, rather than within, the familiar boundaries of habitat type. It may also be described as a “fugitive” landscape, containing few of the ecological features that are required to support a thriving vegetative environment. Examples of an interstitial habitat include a hardy sedum clinging to a rock face or a lone pioneer grass species establishing itself on a sand dune.



Features

- Often consists of nitrogen-fixing, pioneer plant species.
- Tolerates adverse growing conditions.
- Low level of maintenance required.
- May act as a food source for wildlife at a crucial moment.
- Small-scale ecological niches.

5.0 High-Density Urban Typologies

In many regions of the world, grassy embankments, pebbled streamsides, and patches of thick vegetation have been replaced by concrete sidewalks, busy roadways, vertical walls and enclosed spaces. Urbanization has significantly altered landscapes worldwide. Consequently, several basic elements of wildlife habitat have been changed, compromised, or eliminated altogether.

The habitat types and their associated characteristics will provide a foundation upon which to explore the introduction of songbird habitat into urban landscapes. However, none of these habitats can be repeated precisely in a highly dense urban neighbourhood. The habitat types will be modified considerably in some areas in order to include them in a high-density community. However, their core ecological features should be observed and incorporated to the greatest degree possible in all environments focused upon habitat.

In order to modify our urban environments so that they might provide habitat for songbirds and other species, we will review the current form and purpose of general urban typologies. Subsequently, opportunities for modifying these types will be explored. The first step is to identify the basic spatial types in an urban development.

5.1 Urban Spatial Types

- Waterfront Promenade
- Wharf
- Park
- Pocket Park
- Sports Field
- Rights-of-Way (Rail, Power, Utility)
- Greenway
- Commercial Storefront
- Plaza
- Boulevard
- Rooftop
- Residential Frontage

6.0 Design Principles

When applied to urban landscape design, the following principles will assist in the establishment of habitat value for songbirds.

1. Habitat doesn't have to look wild.

Urban landscape designers are often resistant to constructing a high quality habitat for fear that it might look untidy, uncared for, and messy or that maintenance may be time consuming, expensive, and difficult. The belief that habitat is inherently messy looking and visually unattractive can be a barrier to implementing habitat-focused landscape design in urban environments.

A carefully chosen, well-thought out palette of plant species ensures that the aesthetics of a designed landscape can be achieved while providing moderate to high habitat value. Instead of selecting the ideal native plant for a habitat type, sometimes a non-native may be substituted, still contributing to habitat quality with features such as persistent fruits or a physical form beneficial to nesting. Habitat landscapes are also not required to be naturalistic in appearance; they may have geometric and formal layouts.

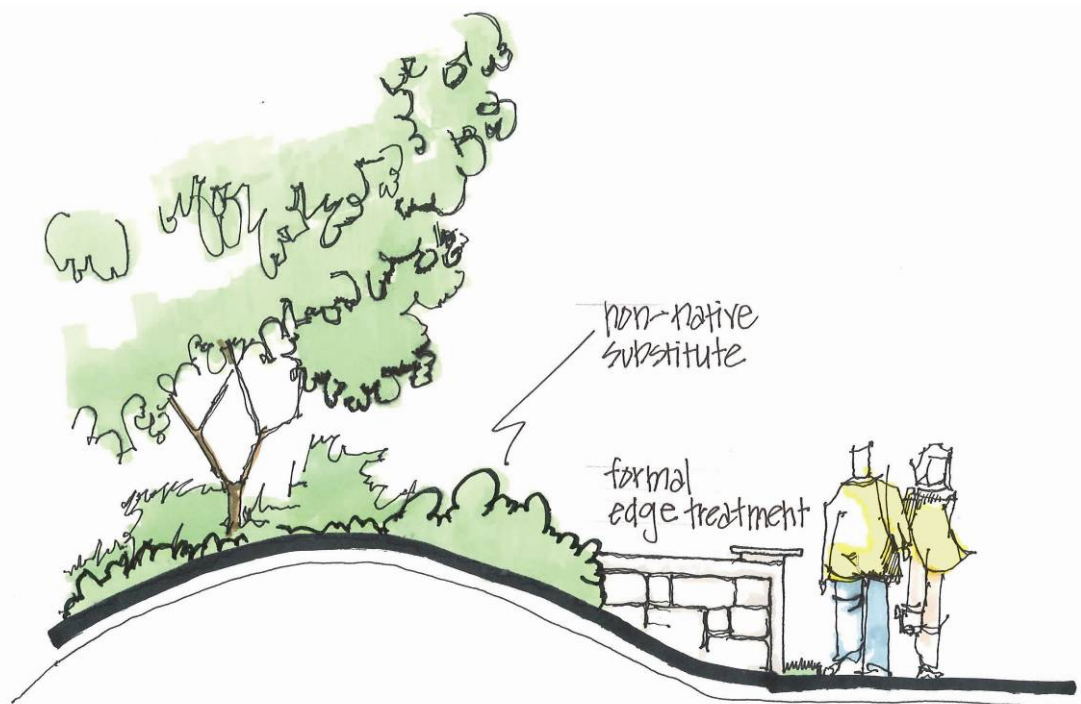


2. Contrast formal and informal landscapes for a balance between increased habitat value and aesthetic qualities.

Engaging the contrast between formal and informal landscapes as a design advantage allows the integration of valuable songbird habitat and urban lifestyle values. It is important for songbird habitat that some areas are planted with a majority of native plants, chosen specifically for their high habitat value. However, it is also important for urban neighbourhoods to meet at least some level of the public demand for a well-maintained, organized landscape aesthetic. Contrasting these two contradictory ideals is a way to bring about an interesting, attractive landscape within a united scheme.

Patches of formal gardens interspersed with patches of wild habitat gardens is one way to contrast these qualities. In wild habitat patches, plants that cannot be included in other areas for their difficulty to maintain or lack of aesthetic qualities will fit into this uncultivated atmosphere. In the formal gardens, non-native as well as native plants may be used, allowing greater flexibility and control over a manicured aesthetic quality. Non-native plants that are included here should be chosen for their ability to increase habitat value.

Informal areas may also be more aesthetically pleasing when their boundaries are formal, neat, and controlled e.g. a perennial butterfly garden with a boxwood edging or forest habitat with a mown lawn strip between the forest and the path.

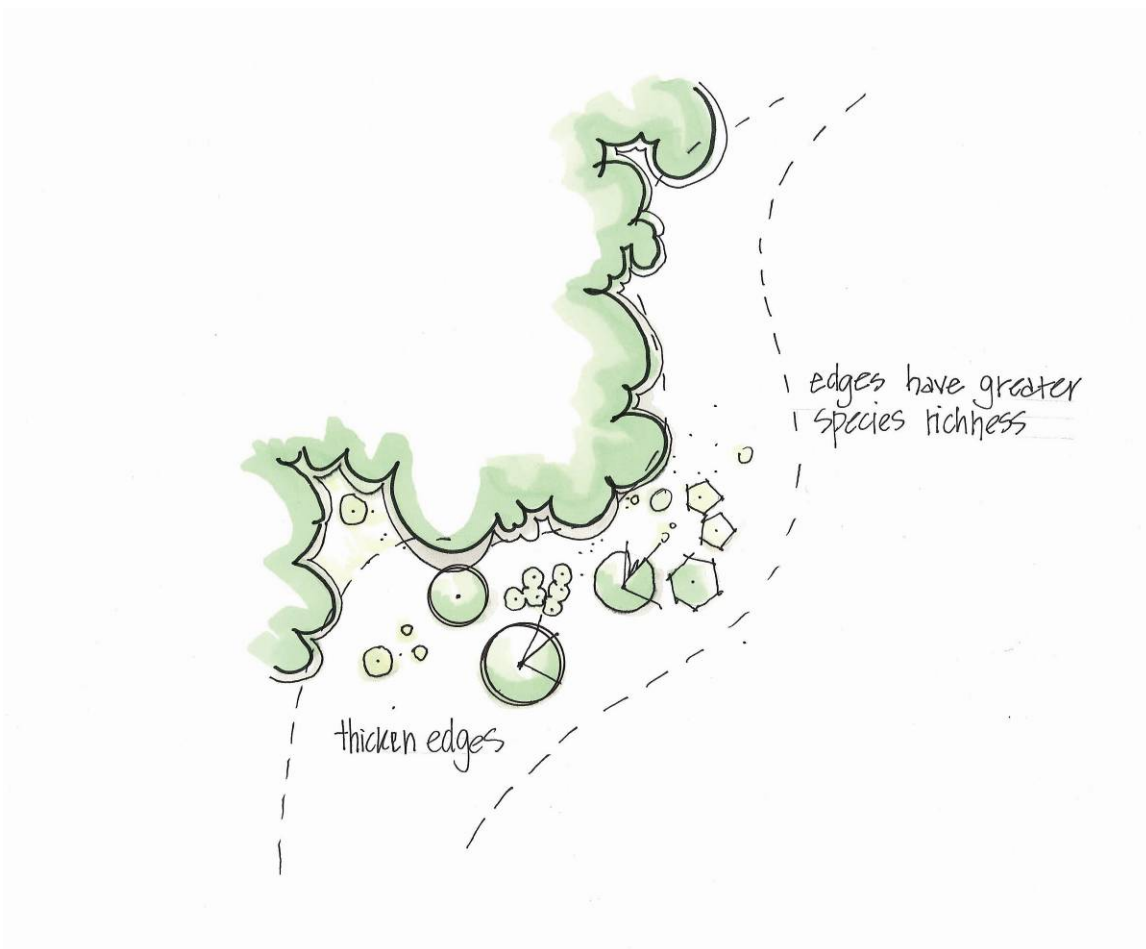


3. Wherever possible, thicken the edges.

Patches of habitat should be thickened wherever possible in order to maximize the productivity and value of habitat for songbirds and other species. For example, riparian

vegetation surrounding waterways should be as wide as possible. This ensures that the water system is preserved. The surrounding riparian vegetation performs all of the ecosystem services necessary such as filtering stormwater runoff, providing native groundcover and leaf litter for fish and amphibians, and having a variety of tree species to stabilize the stream banks.

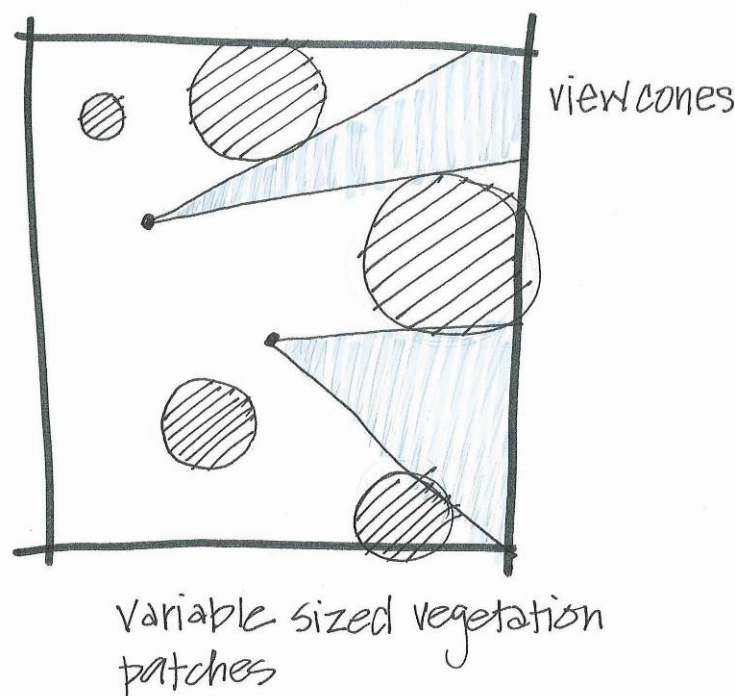
Note that the edges (or boundaries) between two different ecological systems within the landscape are of special importance and should be treated sensitively. These areas tend to have a high diversity of plant and animal species (species richness) for various reasons. The resources of both habitat types (on either side of the edge) are available for species to utilize, providing them with a greater assortment of habitat features than the sole features of one system. Also, unique niches are created in these areas due to the special conditions that often arise from the interaction between two different systems. Landscape edges (the border between habitat types) should be treated carefully to ensure a minimum of disturbance. Curved and gradual edges increase the likelihood of species richness.



4. Maximize horizontal and vertical diversity for habitat and design benefits.

Structural diversity, both horizontal and vertical, provides a greater complexity of conditions within a landscape. This complexity creates a wide variety of soil, moisture, and light characteristics, therefore creating more habitat niches for songbirds. Different species prefer different combinations of habitat characteristics.

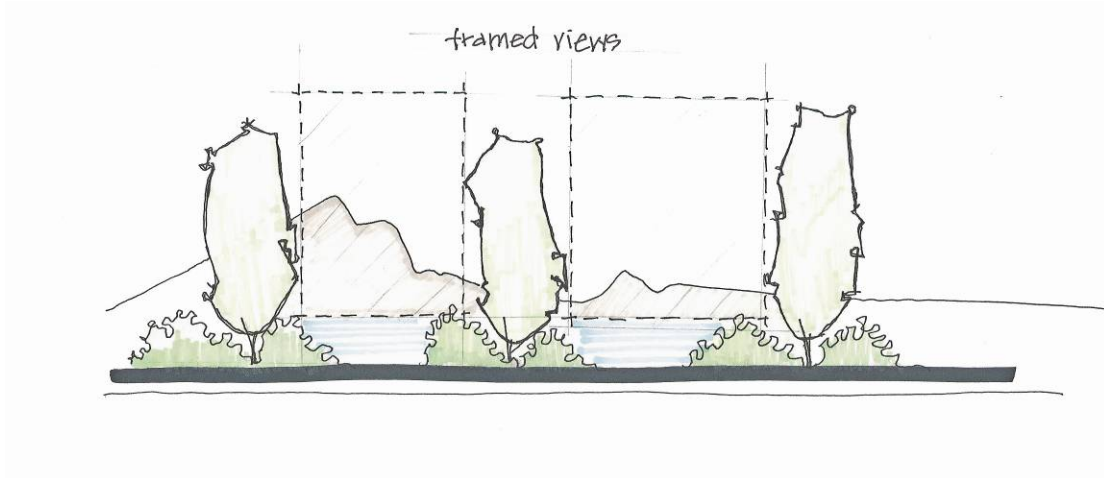
From a design standpoint, integrating structural diversity may contribute to a greater variety of landscape configurations and visual patterns to work with. Creating diversity with “windows” and “doors” in the vegetative wall allows design qualities such as view corridors and surveillance openings to be established. Areas of surveillance are particularly important for CPTED (crime prevention through environmental design) considerations.



5. Views provide the landscape pattern that will inform the placement of habitat patches.

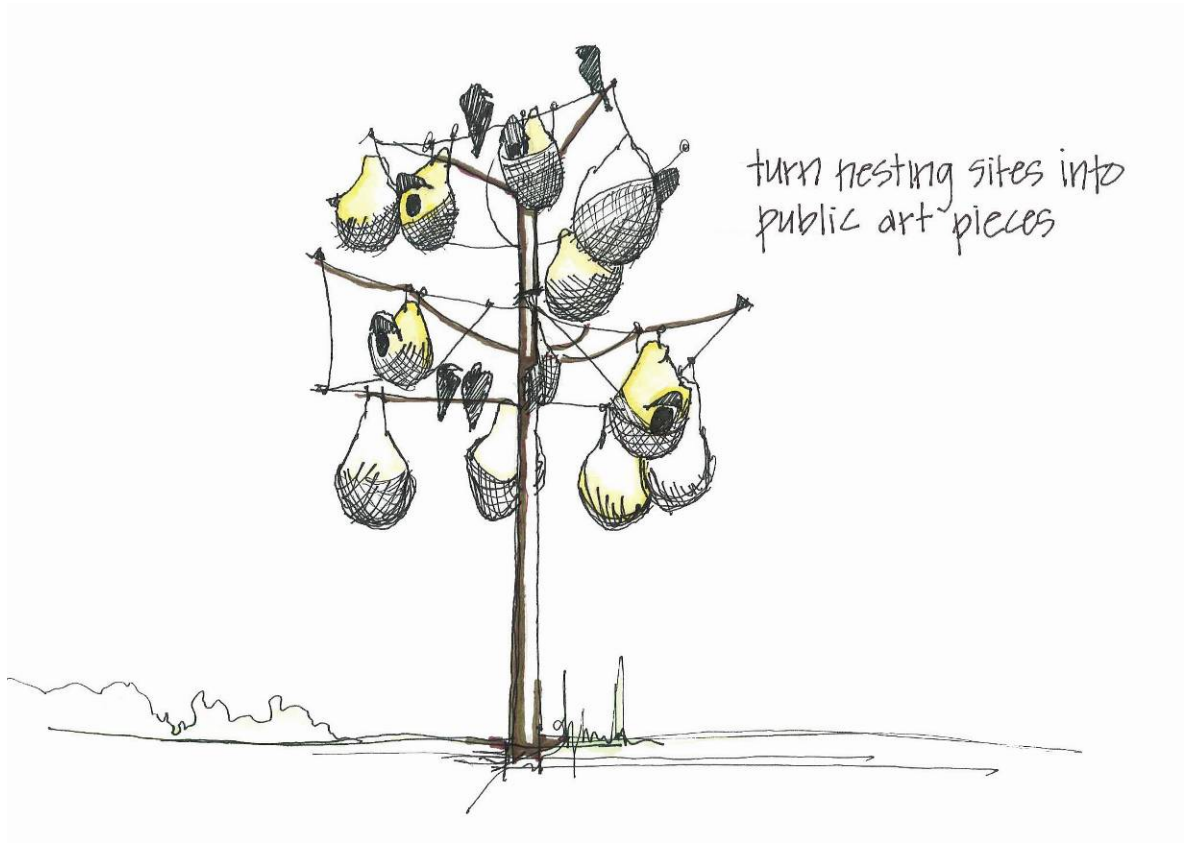
View cones should be considered and then used to define the placement of songbird habitat patches. Habitat types with low vegetative structure and formal, manicured landscape patches may be set within the scope of the view cones. Having the view cones established as a foundational landscape pattern will ensure that areas with high levels of vertical stratification do not compromise urban design values, such as views. Vertically stratified patches of habitat may be set outside of the view cone frame. A series of different landscape rooms can be inspired by the viewscape composition,

creating rooms, views, corridors, themed islands and groves throughout the landscape. Also, it is beneficial to choose habitat types that work with, rather than obstruct, desired views e.g. wetlands, meadows, and old fields.



6. Public art can support songbird habitat.

In accordance with EFL's Public Art Strategy, the weaving of songbird habitat into the community's public art strategy may potentially create a multiplicity of beautiful environments with living, ecological features. It provides designers with an enormous source of inspiration and direction for producing environmentally enhanced art. Features such as nesting boxes, bird feeders, educational programs, and public events are all ways of creating a community rich in public art and songbird habitat.

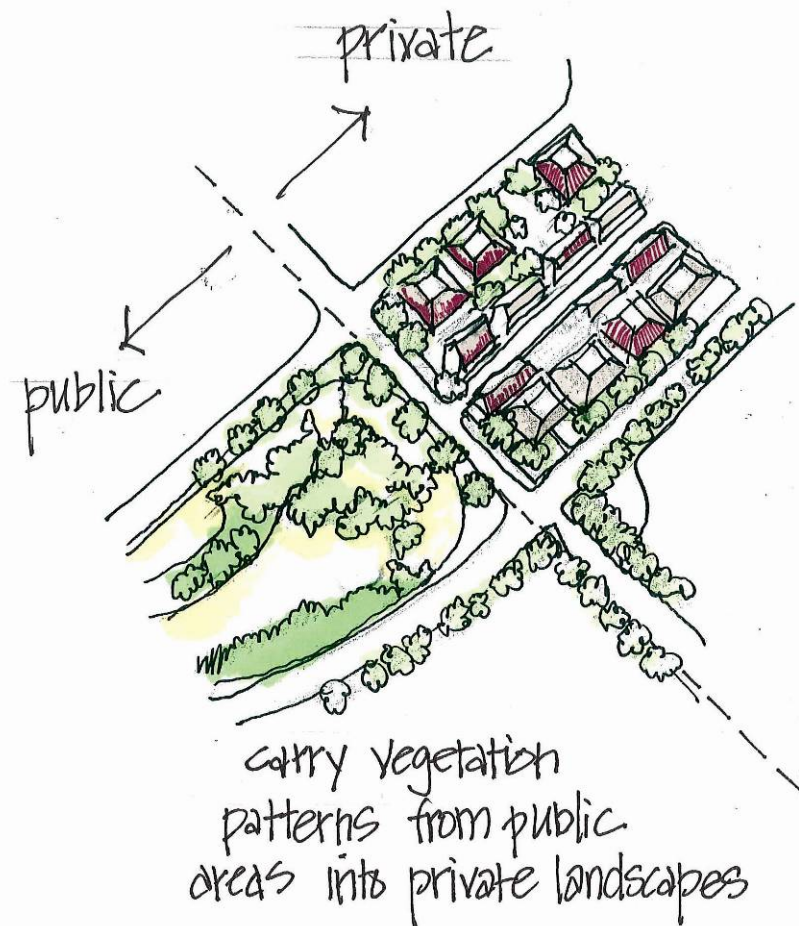


7. Public and private land should be designed together, from a habitat point of view.

The relationship between private and public spaces should be utilized in order to maximize possibilities for highly productive songbird habitat. Public and private spaces intersect in various ways. Often, they are visually or functionally distinct spaces, sometimes separated by a physical boundary. Private and public areas within a community can be designed to increase the amount of productive songbird habitat within the landscape. Habitat opportunities and constraints on adjacent public and private sites should be understood individually, and then as a whole. Due to differences between private and public urban design features, each space will have a different capacity to establish landscape features for songbird habitat. Through the consideration of adjacent spaces and how they might interact, possibilities for habitat creation emerge. Areas with few landscape opportunities for habitat may be combined with

adjacent areas that have more beneficial habitat characteristics in order to increase overall habitat diversity.

For example, a public space feature such as a street tree corridor along a boulevard may be enhanced through the design of an adjacent private space. In isolation, the tree corridor may have moderate habitat value and little vertical stratification. Residential frontages within the private space adjacent to the street could be designed to add a higher level of stratification and greater diversity of plant species, providing habitat characteristics that the street trees alone do not supply. Greater greenspace connectivity and habitat productivity would be added to the area. Combining public and private or treating both as a single habitat despite two levels of ownership should be explored, as it will generate both habitat and aesthetic opportunities.



8. Create appealing, descriptive concepts and names for songbird habitat areas in the landscape.

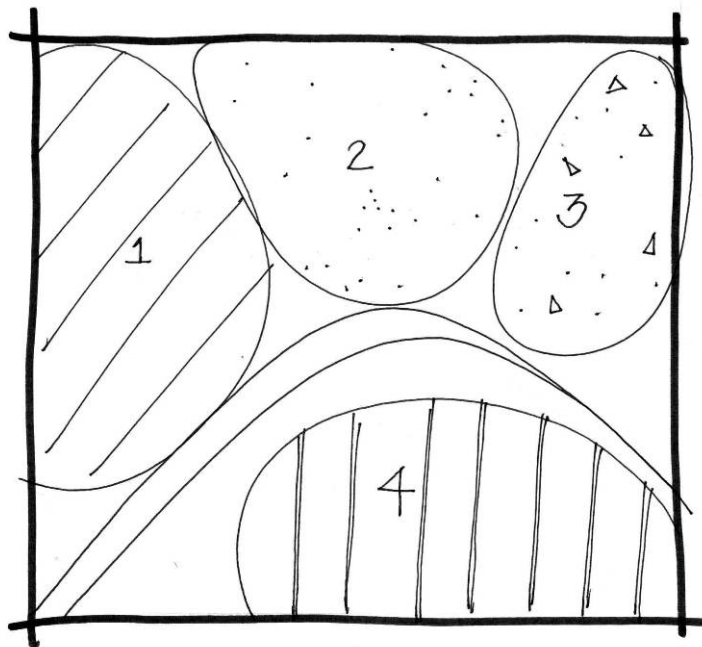
The habitat types implemented in EFL will often be modified to some degree, not always reflecting a habitat's traditional ecological character. For this reason, habitat types and their modified forms should be re-named in order to represent their true nature. This will

ensure that residents, visitors and organizations understand that EFL is not a conservation area per se, but a place to integrate habitat into an urban environment.

In addition, appealing, descriptive names will add to the lively urban-ecological character of the EFL community. The names of landscapes and their associated features may also bring an educational element to the place, generating familiarity with songbirds and their ecological requirements.

9. A wide palette of plants throughout the entire site will provide plant species richness for habitat value.

Plant species richness is a component of most healthy habitat types. A wide range of both native and non-native plant species should be included in the plant palette. This will allow a diversity of design ideas to be explored and increase the probability of creating appealing habitats that songbirds will utilize. Native plants should be used in as many areas as possible. Native plants are well-adapted to the landscape and to the set of migratory birds that have historically used them. For example, migratory birds are naturally adapted to the time frames within which native plants bloom and produce fruit.



greater variety of habitat types result in greater diversity of bird species

10. Provide foraging and nesting habitat wherever appropriate.

All areas of the site should be considered for songbird habitat value. Even the most urban site may be able to make a contribution to habitat quality in some way. Lush planting boxes, vine screens and rooftop gardens are some of the ways in which urban spaces are adapting to accommodate beneficial native vegetation. In addition to providing wildlife habitat, vegetation is becoming increasingly valued, accepted and promoted in urban environments for many reasons.

EFL's location in the Pacific Flyway makes implementing songbird habitat even more imperative. With the reduction of habitat in North America, there are fewer stopovers for birds to rest and regain body weight during their migration. Sometimes, the most important thing an urban area provides is a much needed food source for a single bird in the course of a day, located on one balcony, in the heart of a city.

fruit bearing plant species provide food sources
in urban areas



7.0 Urban Songbird Habitat Guidelines for East Fraserlands

To reverse the accelerated loss of habitat, urban landscapes must embrace new ways of organizing and constructing space. The urgency and severity of habitat loss should not only be looked at as a failure of our cities, but also as an opportunity to explore and adopt new, innovative designs. The challenge for urban communities is to move into a new era embodying a balance between human settlements and healthy ecosystems.

Excellence in urban design arises from our interaction with the surrounding environment and the world as a whole. To create exemplary living spaces, design should be responsive to the visions of a region and its people. East Fraserlands is part of a new movement of communities towards vital, healthy spaces that contribute to the well-being of the region, the city, ecosystems, wildlife, and residents. It is not an easy task to balance the divergent factors of modern lifestyles and changing urban ecosystems, but East Fraserlands is an excellent position to do so. With its location in one of the largest municipal regions in Canada and one of the most ecologically sensitive areas in the province, EFL will reflect the values of a sustainable development. In addition to giving new hope to the survival of songbirds passing through and inhabiting the Greater Vancouver region, the creation of bird habitat will benefit the community in countless different ways. Watersheds and water quality will be protected, genetic plant diversity will be preserved, and psychological benefits will be enjoyed by residents and visitors.

So how do we change the function and impact of our urban spaces? The book, *Songbirds in the City: A Celebration*, sites the high level of paved surfaces and the lack of native plant species in city environments as key factors contributing to urban habitat loss. These are aspects of an urban environment that can be addressed and shifted with relative ease. In addition, the investigation into merging ecology and urbanity is young. A myriad of solutions have yet to be found, implemented and tested. The following section outlines the urban typologies (listed previously in the document) that make up modern communities and that will be key elements of the East Fraserlands community. The opportunities and constraints of these typologies will be examined in order to uncover superior and distinct design strategies, specifically of benefit to songbirds.

7.1 Waterfront Promenade

Description

East Fraserlands' waterfront promenade runs along the Fraser River for the length of the site, providing a pathway for both pedestrians and cyclists. It will pass through a variety of habitat types and urban settings. The waterfront promenade presents an opportunity to protect sensitive waterfront habitat through controlling access and directing the movement of residents and visitors along the Fraser River Shoreline. In addition, the integration of songbird habitat with urban lifestyles presents an opportunity to create a highly unique and beautiful aesthetic along the promenade.

Suggested Habitat Types

Wetland – shoreline side of promenade
Riparian – shoreline and upland side of promenade
Old Field – shoreline side of promenade
Park – upland side of promenade
Mixed forest – upland side of promenade

Design Guidelines

Upland - Park and Mixed Forest Habitat Types

The upland (north) side of the waterfront promenade will consist of open mown grass with islands of trees and shrubs in keeping with the features of a Park habitat type. The upland edge will be a more organized, "tidy" landscape than the riparian zone along the shoreline. Non-native as well as native plants may be used in the islands of vegetation, allowing greater flexibility and control over the manicured aesthetic quality of the area. However, the non-native plants that are included should be chosen for their ability to increase habitat value with characteristics such as persistent fruits or seeds, a wide variety of foliage heights, and a diversity of species types.

Larger islands of vegetation may be included in this zone in order to establish areas of the Mixed Forest habitat type. These areas may be included on the less urban ends of the site and be located on the east and west sides of buildings to prevent the blockage of view corridors. This area should include groves of conifers and as much native vegetation and vertical foliage stratification as possible.

Shoreline – Riparian, Wetland, and Old Field Habitat Types

EFL's shoreline habitat will be preserved and upgraded, providing a space for both Riparian and Wetland habitat types. Three zones of shoreline with varying degrees of habitat productivity and diversity have been identified. The waterfront edge of the promenade will consist of mudflat, intertidal marsh, and riparian vegetation, important for creating habitat for fish and other wildlife, in addition to songbirds. The shoreline habitat will be a low maintenance, highly natural environment ensuring minimal disturbance, especially in the west and east zones of higher habitat productivity.

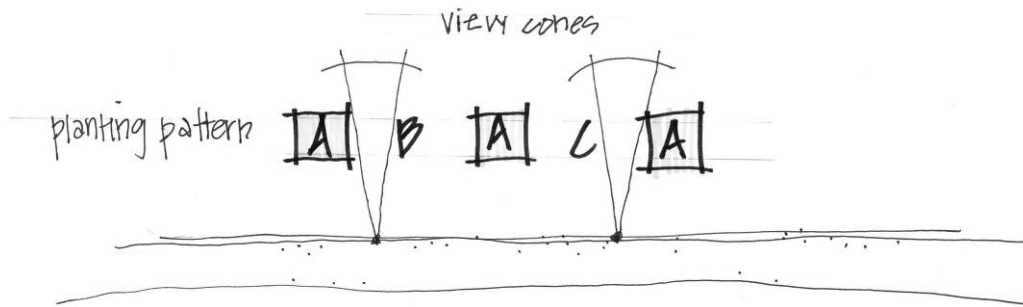
The shoreline edge of the waterfront should be planted with native plants, chosen specifically for their high habitat value. This area is optimal for the inclusion of "messy-looking," less tended species of plants as it is located in the most naturalistic zone on the

site. Plants that cannot be included in other areas for their difficulty to maintain or lack of aesthetic qualities fit into the uncultivated atmosphere of the area. In addition to the plant palette provided for this zone, it is essential to mention the importance of establishing patches of cottonwood trees along the shoreline. Cottonwoods serve a group of birds of high concern – neotropical migrants from Mexico, Central and South America – and therefore add a significant degree of habitat value to the site.

View cones from upland residences should be considered and used to define the placement of a series of landscape rooms. Drought tolerant un-mown grasses should be positioned within the view cones, to ensure that views are not interrupted. Patches of woody trees and shrubs should be added outside of the view cone frame, introducing modified Old Field habitat to the site. Plant palettes may also define the configuration and characteristics of the rooms. Two or three plant palettes combined in various ways could inspire the design of several different landscape rooms.

Landscape as a Musical Score - A Series of Landscaped Rooms

In order to craft a balance between human and songbird habitats, landscape design along the waterfront promenade should be envisioned as a musical score. Both human and songbird habitat features will be displayed with patches of wild habitat gardens followed by patches of formal gardens. Walking along the waterfront promenade will create a sense of moving through a series of different landscape rooms. In addition, a variety of other concepts can also be incorporated into the idea of landscape rooms, such as seasonal gardens or other themes.



Highlights

- Envision landscape as a musical score.
- Preserve and use view cones as design guidelines.
- Design a series of landscape rooms - walking through wild patches, then into formal gardens, then back to wild patches, etc.
 - Work other themes, such as seasonal gardens, into the idea of landscape rooms.
 - Consider choosing two or three plant palettes, then combining them in various ways to develop different rooms.
- Plant the shoreline edge with native plants.

- Include emergent vegetation in the Kinross Park and Avalon Park tidal slough areas.
- Ensure that vegetation hangs over the Fraser River, increasing the riparian habitat productivity.
- Plant the upland edge of the waterfront with some non-native plants (chosen for a high habitat value).
- Mature cottonwood patches – planted in clusters to avoid blocking views.
 - Cottonwood along the waterfront are important, they serve a high concern group of birds – neotropical migrants from Mexico, Central and South America.
- Plant species suggestions: english hawthorn, interesting varieties of mountain ash (*Sorbus pink pagoda*), dwarf ornamental arctic willow, hawthorns, crab apples, roses, amelanchier.

7.2 Mill Bay Wharf, Plaza, and Foreshore

Description

Mill Bay Wharf and Plaza is structured as a public open space next to a foreshore water's edge landscape. The area is surrounded by commercial, community amenity, and low- and high-rise residential buildings. Most of this area will be hard surfaced, stepping down to the water's edge, including both gravel and planted areas. As an intensely urban area, the Mill Bay Wharf and Plaza provide fewer obvious opportunities for songbird habitat; however, possibilities for various options will be explored.

Suggested Habitat Types

Wetland – within the foreshore water's edge landscape
Riparian – around the foreshore water's edge landscape
Deciduous forest – groves on either side
General – provide food source plant species

Design Guidelines

Foreshore Beach Garden

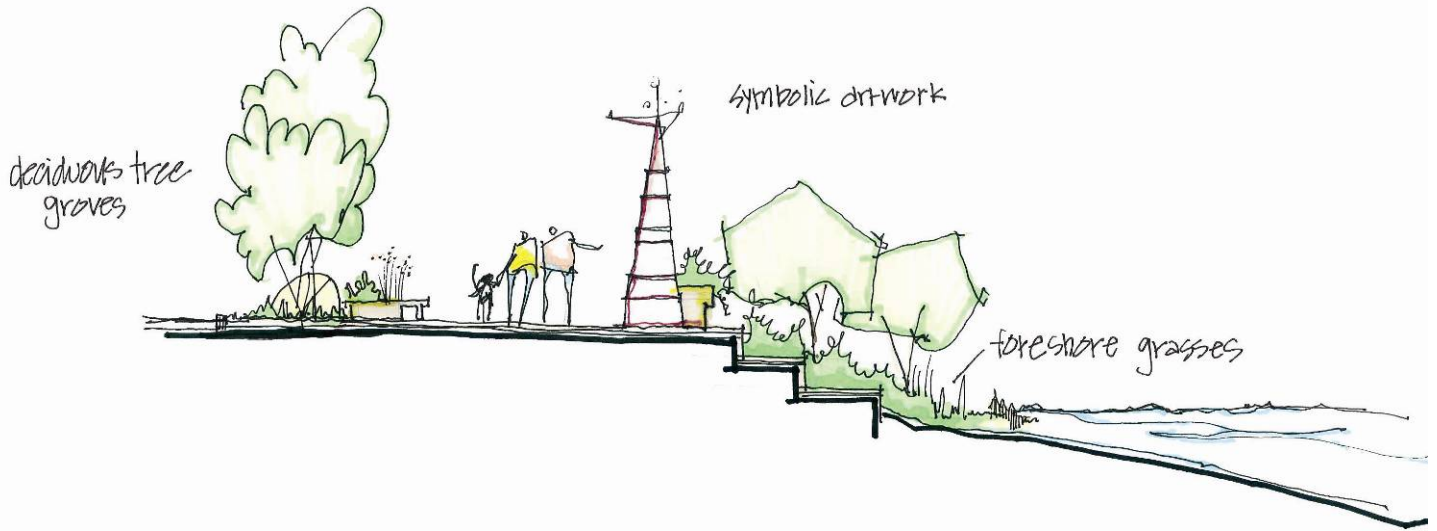
Although the Foreshore Beach Garden is a highly urban garden type, it nonetheless occupies the position of interface between the urban environment and the ecosystem of the Fraser River. In accordance with the Riparian and Wetland habitat types, foreshore grasses and emergent vegetation may be planted along the shoreline.

Carefully Placed Vegetation

In order to maximize the habitat possibilities for the area, the plaza may be book-ended by small groves of Deciduous Forest habitat on the east and west entries to the wharf. The groves may then transition to a modified form of Riparian habitat, if planters are continued to the water's edge. Vegetation in carefully chosen locations along the water's edge adds habitat value, reflecting the Riparian design direction that vegetation should overhang the water body. Patches of ornamental grasses may be used as an alternative to groves, providing habitat for ground nesting species, preserving views, and requiring little maintenance. Native vegetation, especially species providing fruit and seeds, should be included wherever possible throughout the area. Even a small patch of vegetation can act as a food source or a shelter for a songbird at an opportune moment. Creative ways to include vegetation in this public, urban area of the site should be explored. Vine screens and vegetation on benches, shelters, light-posts or other outdoor furniture may bring an inventive, imaginative quality to the space.

Symbolic Exploration of Songbirds and Ecology

As a response to the fact that the Mill Bay Wharf and Plaza have a limited capacity to provide productive songbird habitat, the area may be thought of a place to explore symbolism and imagery related to songbird habitat. Educational features or artwork related to regional biodiversity and the Fraser River Delta ecosystem could be included in this area.



Highlights

- Plant foreshore grasses along the beach shoreline.
- Include areas of emergent vegetation in the water next to the shore.
- Book-end the plaza with deciduous tree groves on the east and west ends.
- Include as much native vegetation as possible in planters throughout the plaza.
- Ensure vegetation (in planters) is overhanging the water body in select locations.
- Establish low lying patches of ornamental vegetation in areas located within view cones.
- Consider including artwork and educational features.

7.3 Avalon Park

Description

Avalon Park is the large public park planned for the east side of the site. The park will provide a space for both active and passive recreational activities with seating, treed areas, play areas, and gardens. A pedestrian “landpier” or boardwalk will run alongside a bio-filtration channel from Marine Drive to the Fraser River, where it meets a tidal slough.

Suggested Habitat Types

Riparian – alongside the Fraser River and the bio-filtration channel
Park – throughout
Deciduous forest – groves within park
Mixed forest – groves within park
Wetland – within the tidal slough area on the Fraser River
Meadow – on the south end of park

Design Guidelines

A Riparian Edge

Avalon Park presents a significant opportunity to establish songbird habitat. The park’s large size allows a variety of habitat types to be included. Most importantly, a Riparian edge should run along the entire length of the bio-filtration channel. In areas of the park where open space requirements would be compromised by a wide vegetative strip, the Riparian edge may be as narrow as 3m. However, in most areas, it should be as wide as possible to provide a greater chance that it will become a highly productive habitat site.

Park Habitat with Patches of Deciduous and Mixed Forest

The habitat type with the most potential in Avalon Park is, naturally, Park habitat. The large, mown open spaces may be enhanced with islands of native trees and shrubs in order to create healthy songbird habitat. Park habitat in this area has a high level of flexibility and may take a variety of forms throughout. Park habitat design guidelines - such as planting native species, ensuring a minimum patch size of 10 sq m, and many layers of vegetation - should be considered.

Larger islands of vegetation should be included in specified areas to create areas of Deciduous and Mixed Forest habitats. Forest areas may be located in the corners of the open park spaces. This would ensure that there would be little compromise to open space requirements. The Deciduous or Mixed habitat patches can have higher canopies in the corners and these areas will provide space for sitting in the shade and watching activities on the field. In addition to the landpier along the length of the park, smaller pathways can wind their way through the forest patches leading to semi-private, quiet seating areas.

Vegetation should be built into the landpier wherever possible. Columns along the landpier may be covered with climbing vines, greatly adding to the beauty and unique

quality of the walkway, in addition to creating habitat. Nesting boxes would provide temporary or permanent shelter for songbirds and offer opportunities for public art.

Shoreline – Riparian and Wetland Habitat Types

The shoreline of Avalon Park will be treated in accordance with the design guidelines for the Waterfront Promenade. This zone will incorporate both riparian and wetland habitat types consisting of a wide variety of mudflat, inter-tidal marsh, riparian and emergent vegetation. See *Waterfront Promenade - Design Guidelines* for additional details.

A Riverside Meadow

Where Avalon Park widens as it nears the Fraser River shoreline, there is additional space that may be used as a meadow, made up of wildflowers and grasses. The potential for Meadow habitat (where human access would be limited, except perhaps passing through on a boardwalk) is greater in this area of the park due to the pre-existing ecological sensitivity of the surrounding wetland and shoreline. Also, the Meadow habitat requirement of including nearby perch trees could be readily implemented in this area with its close proximity to the park and associated tree groves.



Highlights

- Place Riparian habitat edge along the bio-filtration channel.
 - Ensure that the riparian edge is a *minimum* of 5m wide; wider where possible.
- Create large areas of Park habitat, including the listed design features of the Park habitat type.
 - Establish islands (min 10 sq ft) of mixed or deciduous native vegetation.
- Create areas of Mixed or Deciduous Forest habitat.

- Locate Forest habitat in the corners of open park space to lessen the impact on open space requirements.
- Ensure these patches have high canopies.
- Locate Forest habitat where shaded seating or privacy is desired.
- Incorporate vegetation along the landpier.
 - Add columns covered with climbing vines, enhancing the aesthetic value of the space.
 - Add carefully located bird house nesting boxes on top of the columns to provide habitat and opportunities for public art.
- Integrate stormwater into the Riparian zone landscape.

7.4 Kinross Park

Description

Kinross Park will be a naturalistic, ecologically focused park on the west side of the site. Kinross Park is defined by an extensive water system centered on the Kinross water course and by its relationship to the significant green space in the area, Everett Crowley Park. The park will provide passive recreation opportunities such as strolling, ecological education, and bird watching. A cantilevered boardwalk will minimize pedestrian damage to the area. Included in Kinross Park is a Sanctuary Island within the tidal channel. The island is designated as a non-accessible wildlife area.

Suggested Habitat Types

Riparian – alongside Kinross water course and the Fraser River shoreline
Deciduous Forest – within the park (flexible)
Mixed Forest – within the park (flexible)
Wetland – Fraser River Foreshore
Old Field – Kinross Sanctuary Island

Design Guidelines

Upper Kinross - Deciduous and Mixed Forest Habitat

Kinross Park's character as an ecologically rich area of low urban impact facilitates the creation of a wide range of extremely productive songbird habitats. Its placement between the Fraser River foreshore's most important zone of habitat and Everett Crowley Park creates a wildlife corridor that connects valuable patches of existing biodiversity. The upper section of Kinross Park can be entirely Deciduous and/or Mixed Forest habitat. Tree canopy richness, plant species diversity, and vertically stratified layers of vegetation may all be pursued in this area. Plants providing maximum habitat value may be included in this area. Dense forest canopy is appropriate in upper Kinross Park. The vegetation can be used as a design feature to create privacy between residential buildings on either side of the park. View cones and trails may be opened in essential spots, as necessary.

A Natural Riparian Zone

The Kinross water course makes the park a natural zone of Riparian habitat. Riparian habitat should be preserved and enhanced as much as possible, buffering the entire length of the Kinross water course and merging with adjacent Forest habitat zones. The Riparian habitat design directions - such as vegetation overhanging the water body and including a diversity of woody and herbaceous vegetation - should be implemented.

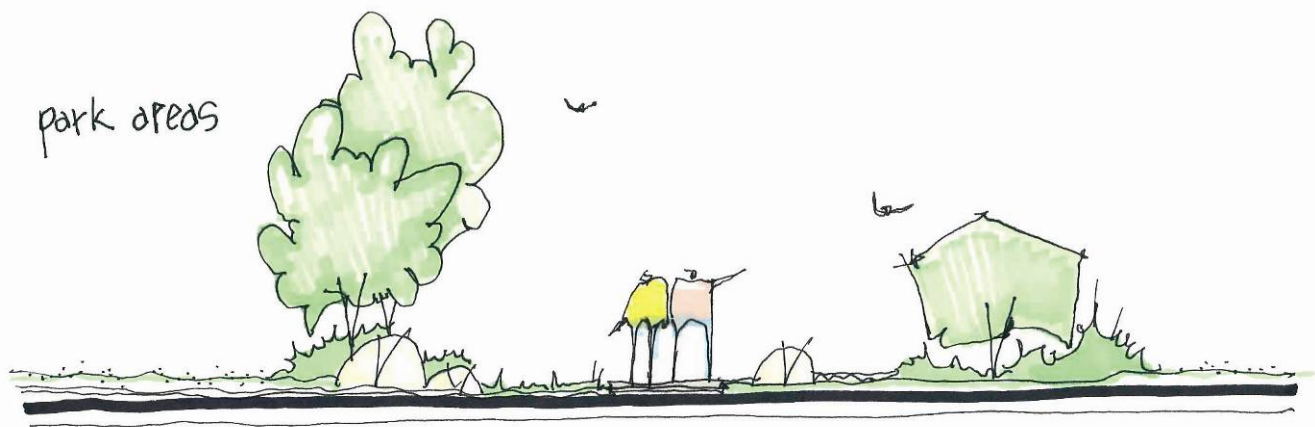
An Ecologically Rich Foreshore – Wetland and Old Field Habitat

The foreshore zone of Kinross Park, where Forest and Riparian habitat types meet the tidal slough and sanctuary island, is the most highly productive and diverse habitat zone on the East Fraserlands site. As mentioned in the *Waterfront Promenade - Design Guidelines*, the shoreline habitat will be preserved and upgraded, providing a space for both riparian and wetland habitat types. The waterfront edge will consist of mudflat, intertidal

marsh, and riparian vegetation, important for creating habitat for fish and other wildlife, in addition to songbirds. The shoreline habitat in this area will be a low maintenance, highly natural environment ensuring minimal disturbance.

A Wetland habitat may be located near the mouth of the Kinross water course and the tidal slough. In accordance with the *Wetland – Design Directions*, the site will have an equal amount of open water and emergent vegetation such as cattails and bulrushes. A Wetland habitat in this area will be further enhanced through the location of the sanctuary island for nesting habitat. Low-slope, grassy banks will cover the edge bordering the wetland.

Kinross Island also provides the primary area of the site suitable for Old Field habitat. This area will not be accessible to the public and will remain an important biodiversity site. The “messy, un-manicured” nature of the Old Field habitat may be fully established in this isolated area. The island should consist of long, unmown grasses with several patches of woody vegetation. A major tree grove with a solid shrub layer should be created near the centre of the island. Extensive diversity of plant form and type including plants with persistent fruits and insect attracting plants should be a primary focus.



Highlights

- Establish a sizable zone of Deciduous and/or Mixed Forest habitat in the northern sections of Kinross Park.
- Preserve and enhance the Riparian habitat along Kinross Creek.
- Maintain a reasonable width for the Riparian habitat along the length of the water course.
- Use Wetland habitat guidelines where Kinross Park meets the foreshore.
- Use Old Field habitat guidelines on Kinross Sanctuary Island.
- Implement design directions for the noted habitat types.
- Ensure public access is carefully guided throughout the park so that ecologically sensitive areas remain undisturbed.

7.5 Sports Field

Description

There are two sports fields planned for the East Fraserlands site, one on the west side of the site, adjacent to a school and one in the north end of Avalon Park. The sports field in Avalon Park is regulation size and both fields will provide the community with sites for organized, active recreation.

Suggested Habitat Types

Park – throughout

Deciduous or Mixed Forest Groves – on edges of the field

General – provide food source plant species where possible

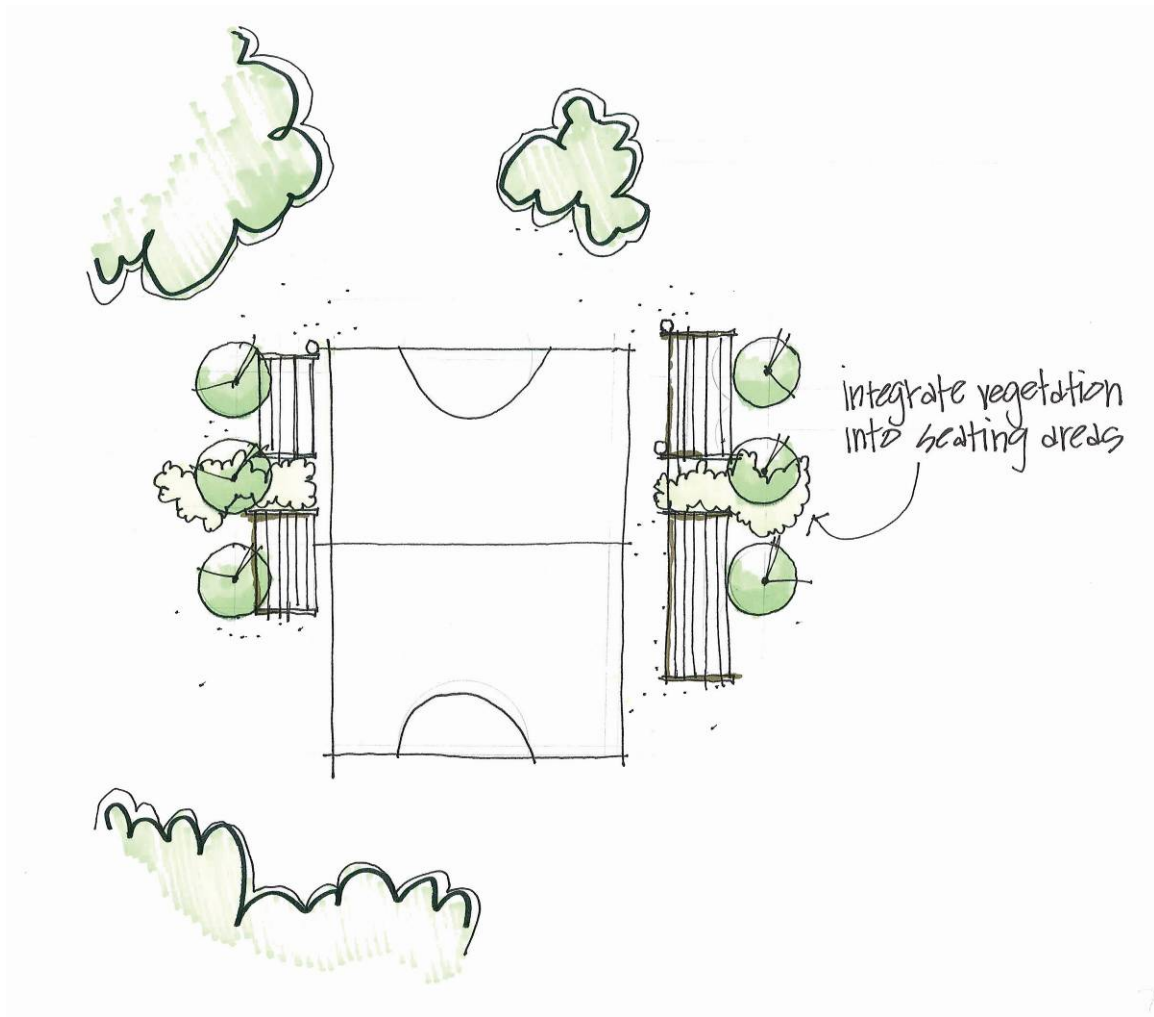
Design Guidelines

Recreation Surrounded by Groves

As a patch of mown grass, a sports field provides a strong possibility for the establishment of Park habitat. Although there is not a possibility for islands of vegetation in the field, patches of Deciduous or Mixed Forest groves may be located on the edges of the field. These islands may be placed strategically for public enjoyment to shade seating areas and to reduce possibilities of sports balls crossing into street right-of-way.

Inventive Habitat Creation

A sports field also provides an interesting opportunity for inventive habitat creation. Vegetation may define the edges of the field. An espaliered fence can add a variety of habitat benefits. In addition to creating a more interesting physical edge than a chain link fence, it may be planted with espaliered willow or trailing vines. Honeysuckle, for example, is a hardy hybrid with persistent fruit that will attract hummingbirds. When considered as a space for songbird habitat, the urban typology of sports fields can extend beyond their formal definition into a beautiful and lively ecological urban space.



Highlights

- Include islands of native vegetation on the edges of the field to ensure a productive Park habitat.
 - Include Deciduous or Mixed Forest groves.
 - Integrate vegetation with seating areas for spectators.
- Define the edge of the area with visually interesting native vegetation.
 - Consider beneficial plant types for songbirds to be located next to the fence, using the fence for support.

7.6 Rights-Of-Way / Greenways

Description

The Canadian Pacific Railway's rail right-of-way runs through the centre of the site, east to west, and has been identified as a public green zone. The rail right-of-way will facilitate pedestrian and cyclist movement as well as reserving a space for possible future rail transportation. It will be bordered on both sides by a landscape buffer and may provide space for community gardens. ParkLane cannot make decisions for how the CPR land is used, but it can design its own land that borders the right-of-way on both sides.

Suggested Habitat Types

Hedgerow – along the length of the RoW

Park – along the length of the RoW

Possible riparian edge – along edge of stormwater swale

Design Guidelines

An Ecological Corridor

As a continuous green space running through the site, the rail right-of-way offers the community a thriving habitat for songbirds and a space where the public may contemplate and enjoy their presence. In addition, it acts as an ecological corridor, strengthening connections between important greenspaces such as Kinross and Avalon Parks. An ecological corridor acts as a route through which songbirds, other wildlife, and plants species interactions may travel.

A Grand Allee of Trees – Park and Hedgerow Habitats

The Right-of-Way has the potential to consist of slightly modified versions of Hedgerow and Park habitats. Sections of the Right-of-Way will be treated differently, depending on the surrounding urban landscape. It is envisioned that the Right-of-Way will have a grand allee of trees, allowing the public to enjoy the classic nature of this landscape type. It has been indicated that the site will be planted with tall, broad trees in the central neighbourhood section and with smaller, flowering trees in the east and west neighbourhood sections to reflect the diversity of urban scales. In the central neighbourhood section, species with big canopies should be included. Oaks, for example, can benefit between 100-200 insect species. The smaller, flowering trees should be chosen from the recommended species list, focusing on trees with high habitat value.

The 4m-wide landscape buffer may be treated as Hedgerow habitat, where possible. This would be appropriate in areas where a thicker layer of vegetation is needed i.e. to separate private space from public space or to create a physical barrier. The vegetative buffer in this area would become increasingly dense, with a variety of plant layers and a feathered edge.

In areas where a thick hedgerow is not suitable, the landscape buffer could take on a lighter character with a sequence of planting patterns underneath the trees. This design would ensure a diversity of plant species could be included, chosen for a both visual

appeal and habitat value. In addition to relating to the series of rooms along the waterfront promenade, this design guideline may incorporate themes such as the creation of a butterfly garden along the length of the right-of-way.

Plantings along this corridor should also capitalize on the presence of water associated with the stormwater management corridor.



Highlights

- Ensure that the allee of trees along the greenway are species that increase habitat value.
- Create a diverse tree canopy to enhance habitat.
- Create Hedgerow habitat within the landscape buffer in appropriate areas.
- Include a diversity of plant types in other areas of the landscape buffer using a sequence of planting patterns.
- Integrate stormwater management areas into bird habitat.

7.7 Commercial Storefront

Description

Commercial buildings within East Fraserlands are positioned to develop a vibrant, complete, and walkable town centre. A town square, close to Marine Way will have a variety of commercial buildings including a mix of small shops, offices, a neighbourhood grocery, and a drug store. High Street, running south from Marine Drive, continues the buildings with a wide variety of uses, down to Mill Bay Wharf and Plaza. In addition to the central urban zone, smaller retail spaces are located at the east and west ends of the site and in each neighbourhood.

Suggested Habitat Types

Interstitial – frontage of commercial buildings
Hedgerow – surrounding commercial buildings
General – provide food source plant species

Design Guidelines

Unique Storefronts

Commercial storefronts are generally a more hard-landscape zone, with fewer opportunities for songbird habitat development. However, even small areas of vegetation contribute to songbird habitat and these urban areas should not be excluded from a habitat strategy. In this way, storefronts may be considered an Interstitial habitat zone. A commercial storefront can incorporate a variety of unique habitat designs. For example, vertical panels for vines may be placed upon what would otherwise be blank walls. Architecturally designed planters may provide room for many native plants, most of which may be plant species providing food sources for songbirds. In some areas, Hedgerow habitat may be created in between or behind commercial buildings to delineate space and create a barrier.



Highlights

- Create unique songbird environments around commercial storefronts.
 - Add vertical panels for vines on blank walls.
 - Include well-designed planters full of a diversity of native plant types.
 - Add shrubs under street and plaza trees.
 - Vary the size and layout of plaza and street trees to provide vertical stratification.

7.8 Streets and Boulevards

Description

Streets in East Fraserlands are planned to reduce flows while creating an efficient road network for the community. Some streets will provide on-street parking, but most parking will be in structures off the streets and parking will be reduced as the community becomes more well-served by transit. The majority of streets within EFL are planned to have boulevards lined with trees and other vegetation. Also, stormwater drainage infrastructure may be included in the boulevards of many streets.

Suggested Habitat Types

Park – along street boulevards
Hedgerow – along street boulevards

Design Guidelines

A Connected Tree Canopy

The inclusion of vegetation, especially a connected tree canopy, alongside streets in urban areas is of considerable importance to songbirds. In cities, street trees create green corridors that offer paths for birds to travel throughout the area, assisting their movement between larger patches of habitat. These corridors along the boulevards of streets in EFL may provide modified versions of Park and Hedgerow habitats.

To create a modified Park habitat, the inclusion of a wide palette of street trees within the street landscape design will provide plant species diversity to increase habitat value. However, in keeping with neighbourhood landscape design guidelines, some streets will be planted with one tree species, rather than a diversity of species on a single street. On boulevards where a single species is planted, the tree should be a species with high habitat value. Further diversity of street trees can be gained through providing two rows of trees: the primary street trees (along the boulevard) and an understory row of trees along residential front entries (private space). In addition, a healthy shrub layer may be added at the base of the tree.

A Welcome Barrier

An opportunity for Hedgerow habitat exists in two areas of the site. On the northern edge of the site, along Marine Drive, a hedgerow may provide a welcome barrier from the traffic and noise of the busy thoroughfare. The hedgerow in this area may be a dense, highly productive thicket, containing all of the Hedgerow design directions. A modified Hedgerow habitat may be established along the boulevard of some streets in areas where the boundary between the public streetscape and private space needs definition.



Highlights

- Draw from a diverse palette of street tree species.
- In areas where only one street tree is used, ensure that it is a species with high habitat value.
- Plant an additional row of trees, where possible.
- Add a healthy shrub layer at the base of trees.
- Establish a dense hedgerow along the north edge of the site.
- Establish a modified hedgerow along street boulevards in areas where a physical border is desirable.

7.9 Rooftop

Definition

East Fraserlands will have a wide variety of rooftops throughout the site. Commercial, industrial and high- and low-rise residential building rooftops present possible areas for songbird habitat.

Suggested Habitat Types

General – provide food source plant species and nesting habitat

Interstitial – rooftop areas that cannot accommodate extensive rooftop gardens

Design Guidelines

Rooftop Gardens – Opportunities for Habitat

Different rooftops will offer different habitat opportunities for songbirds. Rooftops may be greened whenever the architectural form permits it. Private penthouse gardens may combine two different garden types. Extensive gardens, outside of the resident's immediate private space, should have a mix of drought tolerant sedums. The extensive garden needs to be able to flourish with very low maintenance. Within the resident's private space a wider variety of native plant species can be included in an intensive garden. This garden would be the resident's responsibility. An initial list of suggested plant species could be provided to ensure that the intensive garden contained habitat enhancing species.

In addition to residential rooftop gardens, commercial and industrial buildings are useful spaces for the establishment of habitat. The entire rooftop of many buildings may be greened including elements like the elevator penthouse. An example of the plant species diversity that can be achieved on rooftops is Chicago's City Hall. The roof spans almost an entire city block and is covered with approximately 100 different plant species including woodland grasses and hardy ornamental perennials. The project is also an illustration of the aesthetic design features that may be achieved in addition to creating habitat value. Plants were arranged by bloom colour, providing patterns of colour that change with the seasons.

Nesting box structures should be considered on rooftops, as well. Cities provide fewer nesting cavities for songbirds due to a lack of large, mature trees and snags. Nesting boxes for specific bird species should be explored and included on rooftops, as these areas will often be free from human activity. Extensive roofs may be designed as habitat for ground-nesting birds and butterflies.



Highlights

- Create extensive gardens, planted with low-maintenance, drought tolerant sedums and grasses on most roof spaces where possible.
- Add vegetation (green roofs and living walls) on mechanical and elevator penthouses and structures.
- Provide residents with a list of plant species to create a productive garden area within their private space.
- Add nesting box structures on rooftops for the accommodation of as many relevant bird species as possible.
 - Consider integrating nesting boxes with local biodiversity education programs (e.g. fixed camera for observing nest activity).

7.10 Residential Frontages

Description

EFL will be a complete community containing a variety of housing types for people of all ages, incomes, and abilities. Residential types will include rowhouses, ground-oriented units for families, condominiums, and apartments.

Suggested Habitat Types

Park – throughout

Interstitial - balconies

General – provide food source plant species, water sources and nesting habitat

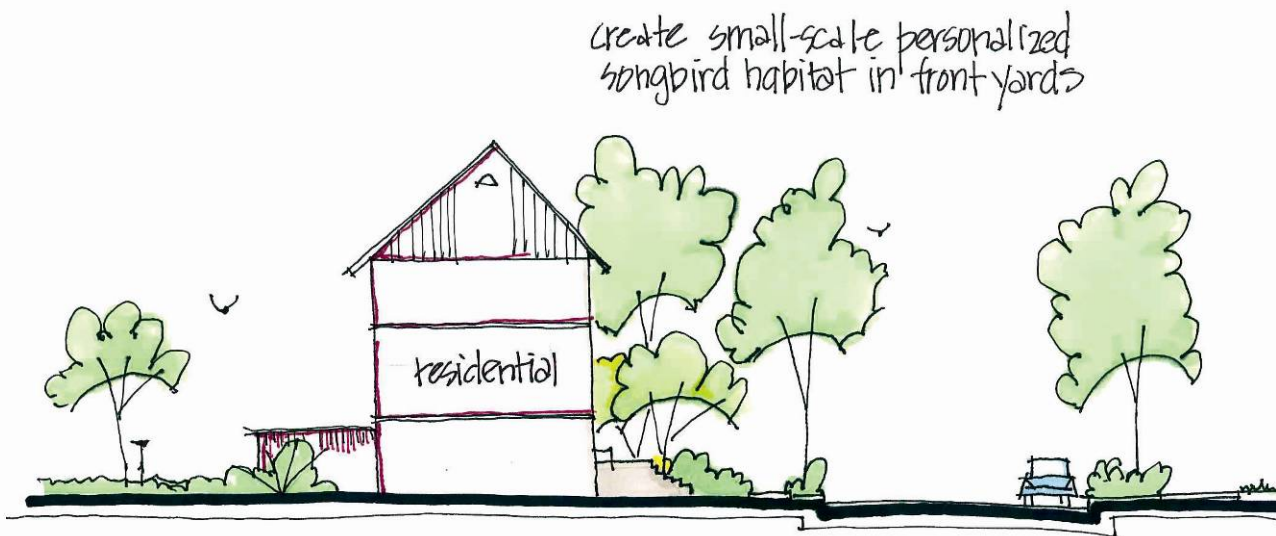
Design Guidelines

A Cumulative Habitat

Several hundred residential frontages, when landscaped with a focus on songbirds, add up to a significant portion of habitat. The most appropriate type for a residential frontage is Park habitat. In addition to mown grass, residential frontages may be enhanced by a landscape with a rich diversity of native trees and shrubs. Vertical plant diversity should be increased in this area by adding several shrub layers. These layers may be further encouraged by the built form of the residence. Exterior space can be designed with stratified planting boxes, providing three or more layers of garden space. A row of trees along the residential frontages adds to the ecological productivity of the boulevard, increasing tree species richness and the connectivity of the tree canopy.

Small-Scale Personalized Habitat

Residential frontages and back yards are places where songbird habitat can be personalized. Nesting boxes, bird baths, and water collected in stormwater drainage features all enhance songbird habitat, bringing birds into spaces where they may be observed and enjoyed by residents. The large personal green space or 'yard' is becoming less common, but no space is too small to be overlooked for songbird habitat development. Douglas College's book, [Urban Biodiversity: Exploring Natural Habitat and its Value in Cities](#), points out that even balcony gardens are valuable resources for habitat. One balcony garden may provide a food source for a passing songbird on its way to a nesting site.



Highlights

- Create a rich Park habitat within as many residential frontages as possible to produce large connected patches of habitat.
 - Include a diversity of native trees and shrubs.
 - Include several shrub layers.
- Design a residential frontage that incorporates several layers of vertical garden stratification into the built form.
- Add a row of understory trees adjacent to the streetscape to increase the canopy richness of the boulevard trees.
- Create small-scale, personalized songbird habitat in the residential frontages with nesting boxes, bird baths, and stormwater drainage features.
- Encourage the creation of habitat on residential balconies in pots, planter boxes and hanging baskets.

8.0 Public Art – An Opportunity for the Celebration of Songbirds

8.1 Introduction

Public art will be included in several areas of East Fraserlands such as public park areas, plazas, and along the riverfront promenade. EFL will include a broad Public Art Strategy with a diverse set of objectives including “Encourage the interaction of the community and the ecosystems of the site” and “Animate the public realm with delight and interest.”

8.2 Public Art & Habitat Design Guidelines

Inspiration, Ecology, and Songbirds

The integration of the Songbird Strategy with the Public Art Strategy may potentially create a multiplicity of beautiful environments with living, ecological features. It provides designers with an enormous source of inspiration and direction for producing environmentally enhanced art.

Nesting Boxes as Art

Nesting boxes are a songbird habitat feature that can make a substantial contribution to the public art on the site. Nesting boxes could be integrated with the architectural style of the neighbourhood, fitting in to the surroundings and adding to the beauty of EFL's aesthetic character. Alternatively, they could become unique art pieces.

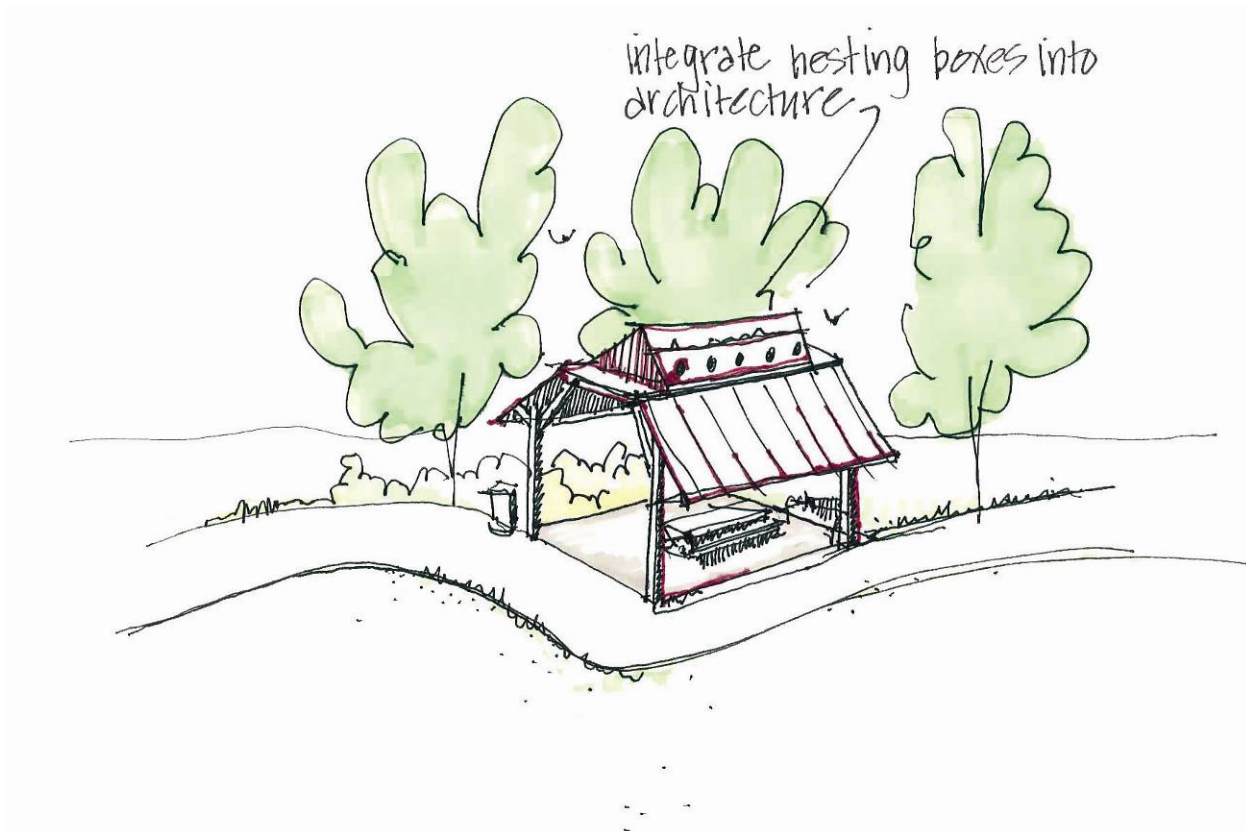
A nest box program can increase the avian population on a site. However, most nest box programs are labour intensive and likely not suitable for EFL. Nesting boxes that are difficult to maintain - such as wood duck boxes - should be avoided.

However colony nesting swallows and martins may be excellent candidates for nest box installations. These birds eat large quantities of flying insects like mosquitoes and display attractive aerial acrobatics. Candidate species are barn, cliff and bank swallows and purple martins.

Nesting boxes would need to be customized depending upon which species they were intended for. Purple martin boxes must be placed over open water. Successful artificial colonies have been build in the lower mainland by clustering specially designed martin boxes on dolphins in open water. Barn swallows would benefit from platforms at the waterfront edge where they can nest together in colonies. Their droppings falling into the water or shrub layer would further enhance ecological value. Cliff and bank swallows might be attracted to artificial nesting sites set into the shoreline.

Signature Songbird Art Pieces

Signature songbird art pieces would be a beautiful and educational addition to the EFL landscape. The scope and variety of forms this synthesis could produce is virtually limitless. A highly stylized bird feeder may be a public landmark. Bird watching benches focused on songbird art attractions may further enhance the character of the public space. An educational songbird feature may consist of each park having its own signature art piece related to a specific habitat type. Feeder and nesting box management may be undertaken by partnerships between ParkLane, the City, conservation organizations and art councils. Events such as public art competitions for red listed species habitat can further enhance EFL's Public Art Strategy objective to "encourage the interaction of the community and the ecosystems of the site."



Highlights

- Make use of songbird nest boxes for the exploration of public art.
 - Integrate boxes with the architectural style or create unique art pieces.
 - Customize and locate nest boxes for specific songbird species.
 - Avoid nest boxes that are difficult to maintain.
- Integrate public songbird art with educational programming.
- Create management partnerships with local government, conservation organizations and art councils.
- Encourage public events such as songbird art competitions.

9.0 Songbird Habitat and CPTED

9.1 Introduction to CPTED

Crime Prevention through Environmental Design (CPTED) reduces situational opportunities for crime to occur within neighbourhoods. It is a holistic approach that combines social and environmental strategies in addressing crime prevention. CPTED attempts to create environments that are friendly, cared for, and comfortable in a community with the added intention of reducing behaviours that lead to crime. Types of spaces that CPTED design avoids are: hidden areas such as open storage spaces where an offender can hide; unclaimed areas like isolated parking lots, and corridors with large volumes of people moving through. CPTED offers a list of design principles, however, it is noted that designs need to be evaluated on a case by case basis.

9.2 Key CPTED Principles Related to Songbird Habitat Strategies

Territoriality and Defensible Space

Overview

Ownership of space infuses the landscape with a well-cared for, maintained quality. When residents take ownership of their surrounding the space is more likely to discourage crime. For example, extending interior space into outdoor spaces is one way to implement this principle. A space with flower pots and benches is more likely to create a feeling of safety and comfort.

Actions

- Encourage residents to engage with both private and public outdoor spaces.
- Create landscapes and features such as public community gardens and private planter boxes that prompt residents to care for and spend time in the landscape.

Hierarchy of Space

Overview

Architectural features should be used to create hierarchies of space between public and private environments. Distinct boundaries between public, semi-private, and private should be obvious. This helps to ensure that private space is not as vulnerable to undesirable uses.

Actions

- Transitions from private to public can be emphasized with various formations of tree and shrub layers.
- Hedgerows can help define boundaries between private and public.

Natural Surveillance

Overview

"Eyes on the street" has become a popular term to describe natural surveillance. Natural surveillance creates community space that makes it easy for residents and visitors to observe the space around them, lowering the likelihood of criminal activity.

Actions

- Create openings (windows and doors) in the vegetative wall to facilitate natural surveillance.
- Carefully consider and identify the locations that would benefit from openings in the vegetative wall so that vegetation is not removed unnecessarily.
- Integrate these openings with the placement of view cones.

Access Control

Overview

Access Control encourages the development of features to create the impression that access into a space will be difficult for undesirable users. This could include a variety of barriers to discourage use.

Actions

- Address access with the careful placement of trees and shrubs.
- Hedgerows may be used as a barrier that is difficult to penetrate.
- Water features may discourage access to some areas.

Image and Maintenance

Overview

Image and maintenance involves the beautification and management of a community space. The area appears more cared for and orderly, lowering the possibility of litter and disrespectful behaviour in an area.

Actions

- Vegetation contributes a substantial amount to the beautification of an area.
- Add trees, shrubs and water features to the landscape to change the nature of a space, shifting it from an unwelcoming, uncomfortable environment to an area where people gather and enjoy their surroundings.

10. Urban Environments and Bird Collisions

Although it is not primarily a landscape design subject, a key issue to consider in the establishment of songbird habitat in urban environments is bird collisions with buildings. Birds sometimes collide with windows and other glass surfaces, not recognizing that they are flying into a solid surface. Depending on the light and the angle, clear glass can be reflective, causing birds to mistake the glass as the sky and vegetation behind them. Clear glass is an issue when the line of vision continues from windows through to windows on the other side of the building, creating the perception of a clear route. Birds also fly into clear glass windows when they are attempting to access plants that are placed inside close to the window. Mirrored glass is an even greater hazard to birds, as it is a highly reflective surface in all light conditions. Light from buildings at night is another problem. Birds are attracted to and confused by the light, causing collisions with structures.

The challenge to reducing collisions in urban areas is that the primary characteristic of one of the most valued architectural features – glass – is in conflict with bird-friendly design requirements. Windows are transparent and often reflective, while the ideal bird-friendly surfaces are nontransparent and nonreflective. Creative design strategies are needed to reduce the possibility of bird collisions. Some of the strategies currently suggested include:

- Planting vegetation close to buildings reduce the possibility of birds flying into the windows at high speeds.
- Breaking up expansive glass surfaces with visual noise such as mullions. From a distance, birds are less likely to approach the building.
- Using patterned or etched glass.
- Including shading devices such as shutters and sun screens.
- Considering a window film that reduces reflectivity and transparency from the outside, but is still transparent from the inside.
- There is a future possibility of glass with embedded or applied UV treatment that birds can see, but humans cannot.

10. Plant List

(In Development)

The following list of plant species provides a palette of habitat-enhancing plants that may be used throughout the EFL site. The plant list should be used in conjunction with the design guidelines in order to achieve optimal songbird habitat.

Plant species richness is a component of most healthy habitat types. A wide range of both native and non-native plant species should be included in the plant palette. This will allow a diversity of design ideas to be explored and increase the probability of creating appealing habitats that songbirds will utilize. Native plants should be used in as many areas as possible. Native plants are well-adapted to the landscape and to the set of migratory birds that have historically used them. Migratory birds are adapted to the time frames within which native plants bloom and produce fruit.

The plant list should also be developed for aesthetic design qualities. Plants that fit well with the site's landscape character and that have attractive qualities such as colourful blossoms are preferable. Non-native plant species with good habitat value are beneficial in areas where native plants do not fit with the landscape design character.

Native Plants

native Trees	Latin Name	Meadow	Deciduous	Mixed	Park	Wetland	Old field	Hedgerow	Riparian	Conditions	Characteristics
Black Cottonwood	Populus balsamifera ssp. Trichocarpa	x	x		x		x		x	Fresh and moist soils, fluctuating groundwater, nitrogen-rich	up to 50m tall
Red Alder	Alnus rubrus	x	x	x	x		x		x	Fresh and moist soils, fluctuating groundwater, nitrogen-rich	up to 25m tall
Pacific Willow	Salix lucida ssp. lasiandra						x			Fresh and moist soils, nitrogen medium to nitrogen rich	up to 12m tall
Pacific Crabapple	Malus fusca					x	x	x		Wet to very wet soils, shade intolerant, nitrogen-rich	2-12m tall
Douglas Hawthorne	Crataegus douglasii						x	x		Moist nutrient rich soils, shade intolerant	up to 8m tall, thorny
Bitter Cherry	Prunus emarginata	x	x	x	x	x	x		x	Moist, along streams	Up to 9m tall
Sweet Cherry	Prunus avium	x	x		x			x		Disturbed early seral stage forests	up to 10m tall
Cascara	Rhamnus purshiana	x	x		x	x	x	x		Very moist and wet soils, fluctuating ground water, nitrogen-rich soils	up to 10m tall, shrubby
Bigleaf Maple	Acer Macrophyllum	x	x		x					Dry to moist, shade intolerant	36m tall, large spreading limbs

Vine Maple	<i>Acer circinatum</i>			x	x				x	Moist, nitrogen-rich, shade tolerant/intolerant	20m, irregularly shaped trunk and branches
Western Hemlock	<i>Tsuga heterophylla</i>			x	x					Dry to wet soils, high organic content, shade intolerant in high rainfall areas	30-50m, narrow crown, sweeping branches
Western Redcedar	<i>Thuja plicata</i>			x	x		x		x	Wet soils	60 m tall, drooping branches, wide at base
Douglas Fir	<i>Pseudotsuga menziesii</i>			x	x		x			Drier soils	85m, branch free lower trunk on older trees
Grand Fir	<i>Abies grandis</i>			x	x					Dry to moist soils	80m, narrow crown
Sitka Spruce	<i>Picea sitchensis</i>			x	x				x	Moist, well-drained soils	70m tall, horizontal branches
Shore Pine	<i>Pinus contorta</i> var. <i>contorta</i>			x	x					Moist, well drained; shade intolerant	20m tall crooked trunk, irregular pillowy crown
native Shrubs	Latin Name	Meadow	Deciduous	Mixed	Park	Wetland	Old field	Hedgerow	Riparian	Conditions	Characteristics
Nootka Rose	<i>Rosa nutkana</i>			x	x	x	x		x	Fresh and very moist soils, fluctuating groundwater tables, nitrogen-rich	3m tall, spindly
Indian-Plum	<i>Oemleria cerasiformis</i>	x	x	x	x	x		x	x	Fresh and very moist soils, fluctuating groundwater tables, nitrogen-rich	Shrub or small tree 1.5-5m tall
Red Flowering Currant	<i>Ribes sanguineum</i>			x	x			x		Very to moderately dry soils, nitrogen-medium	1-3m tall, crooked stems

native Shrubs	Latin Name	Meadow	Deciduous	Mixed	Park	Wetland	Old field	Hedgerow	Riparian	Conditions	Characteristics
Pacific Ninebark	Physocarpus capitatus			x	x	x	x	x		Very moist and we soils, flooding, nitrogen-rich	up to 4m tall, erect to spreading
Saskatoon	Amelanchier alnifolia	x	x	x	x			x		Moderately dry to fresh, shade tolerant, nitrogen-medium	Shrub or small tree, 1-5m tall
Salal	Gaultheria shallon	x	x	x	x			x	x	Shade-tolerant/intolerant, nitrogen-poor soils	Creeping to erect, .2-5m tall
Hardhack	Spiraea douglasii					x	x			Very moist to wet	Erect, leggy, to 2 m tall
Salmonberry	Rubus spectabilis	x	x		x	x			x	Moist to wet, fluctuating groundwater, shade tolerant/intolerant, nitrogen-rich	Erect, branching, to 2 m tall, thickets
Thimbleberry	Rubus parviflorus	x	x	x	x				x	Shade tolerant/intolerant, nitrogen-rich soils	Erect, .5-3 m tall, thickets
Trailing Blackberry	Rubus ursinus	x	x	x	x					Moderately dry to fresh, shade tolerant/intolerant, nitrogen-medium	Trailing, to 50 cm tall
Oregon Boxwood/ Falsebox	Pachistima (Paxistima) myrsinites			x	x					Moderately dry to fresh, shade tolerant/intolerant, nitrogen-poor	Low, dense, evergreen, 20-80 cm tall
Native Mock Orange	Philadelphus lewisii						x			Dry, shade intolerant	Erect, loosely branched, to 3 m tall
Red Osier Dogwood	Cornus stolonifera						x		x	Moist	Freely spreading shrub, 1-6 m tall

Pacific Willow	Salix lucida					x	x			Moist	Tall slender shrub or tree, to 12 m tall
Hookers Willow	Salix hookeriana					x	x			Moist	Shrub or tree to 6 m tall
Evergreen Huckleberry	Vaccinium Ovatum		x	x				x		Dry, shade intolerant	Erect, bushy, to 4m tall
Black Twinberry	Lonicera involucrata					x	x	x	x	Moist soils	Erect to straggly .5-3 m tall
Red Elderberry	Sambucus racemosa	x			x		x	x		Moist soils	Shrub or small tree, up to 6m tall
Tall Oregon Grape	Mahonia aquifolium		x	x				x	x	Dry soils	Stiff-branched shrub, 60cm
Kinnikinnick	Arctostaphylos uva-ursi		x	x	x					Sandy and well-drained soils	Trailing, evergreen, 20 cm tall
Black Raspberry	Rubus leucodermis						x	x			2m
Orange/ Western Climber Trumpet Honeysuckle	Lonicera ciliosa						x	x			Climbing, widely branching vine
Red Huckleberry	Vaccinium parvifolium		x	x					x	Soils rich in decaying wood, partial shade	Erect, strongly angled branches, to 4 m tall
Red Columbine	Aquilegia formosa		x	x	x					Moist soils, sun to partial shade	Perennial herb, erect, 1 m tall
native Emergent Vegetation	Latin Name	Meadow	Deciduous	Mixed	Park	Wetland	Old field	Hedgerow	Riparian	Conditions	Characteristics
Cattails	Typha latifolia, Typha anustifolia					x				Moist to wet soils	Marsh perennial, 1-3 m tall
Hardstem Bulrush	Scirpus validus					x				Moist to wet soils	Stout, cylindrical erect perennial 1-3 m tall
Softstem Bulrush	Scirpus acutis					x				Moist to wet soils	Stout, cylindrical erect perennial 1-3 m tall

Non-Native Plants

non-native Trees	Latin Name	Meadow	Deciduous	Mixed	Park	Wetland	Old field	Hedgerow	Riparian	Conditions	Characteristics
Amur Maple	Acer ginnala				x		x	x		Dry or moist soils, sun to partial shade	up to 5 m
Red Maple	Acer rubrum			x	x					Moderate to moist soils full sun	10m reaching 25 m in maturity
Pine	Pinus spp.	x		x						Dry or moist soils, drought tolerant, sun to partial shade	5-20 m
Cherry	Prunus spp.		x	x	x		x			Dry or moist soils, sun to partial shade	Varies, generally to 9m
Oak	Quercus spp.		x		x					Dry to moist full sun	Varies with species selected
European Mountain Ash	Sorbus aucuparia				x		x	x			
non-native Shrubs	Latin Name	Meadow	Deciduous	Mixed	Park	Wetland	Old field	Hedgerow	Riparian	Conditions	Characteristics
Butterfly Bush	Buddleia davidii				x		x			Dry or moist soils, sun	2m
Tatarian Dogwood	Cornus alba		x	x	x		x	x		Dry or moist soils, sun or partial shade	2m
Cotoneaster	Cotoneaster spp.				x			x		Moist or dry, sun or partial shade	1-3m
Lavalle's Hawthorn	Crataegus x lavalleyi		x	x	x		x	x		Dry or moist soils, drought tolerant, sun or partial shade	6m
Honeysuckle	Lonicera tatarica						x	xx		Dry or moist soils, sun or partial shade	3m

non-native Shrubs	Latin Name	Meadow	Deciduous	Mixed	Park	Wetland	Old field	Hedgerow	Riparian	Conditions	Characteristics
Photinia	Photinia serrulata				x			x		Dry or moist soils, sun or partial shade	4m
Firethorn	Pyracantha coccinea				x			x		Dry to moist soils, sun or partial shade	2m
Multiflora Rose	Rosa multiflora		x	x	x	x	x	x		Dry, drought tolerant, sun	2m
Strawberry Tree	Arbutus unedo				x			x		Dry to moist full sun	10m
Escallonia	Escallonia rubra				x			x		Dry to moist full sun	1.5m responds well to shearing
Hazelnut	Corylus avellana		x	x	x		x	x	x		5m
Silver Buffalo Berry	Shepherdia argentea						x	x		Dry or moist soils, sun or partial shade	5m
Arrowwood	Viburnum dentatum		x	x	x	x	x	x	x	Dry or moist soils, sun or partial shade	4m height and spread
European Highbush Cranberry	Viburnum opulus		x	x	x		x	x		Dry or moist soils, sun or partial shade	3m height and spread
Highbush Cranberry	Viburnum trilobum		x	x	x		x	x		Dry to moist soils, sun to partial shade	3m
Grape (vine)	Vitis spp.				x		x	x		Moist soils, sun to partial shade	10m